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ABSTRACT

The career activities guide in science, part of an Idaho State Department of Vocational Education career exploration series for grades 7, 8, and 9, is designed as supplementary material to enrich the regular curriculum. Any one activity in the guide might be used without involving any other activities. The cross-referenced index indicates grades, subject, career cluster, occupation, and, in most instances, subject concept. Performance objectives, activity situation and steps (mainly scientific experiments), materials, and special recommendations are outlined for the various job titles. Career clusters included are: home economics and consumer; industrial arts; arts, crafts, humanities; business occupations; communications and media; hospitality and recreation; environmental control; personal service; manufacturing; transportation; health occupations; public service; agriculture and natural resources; marine science; marketing and distribution; construction; miscellaneous activities. Subject concepts involve various aspects of science such as temperature, extractions of colors, water testing, blood cells and types, substance analysis, insolubles, heating, simple machines, matter changes, plant growth, energy, gravity, weighing, power, air pollution, and weather bureau services. (EA)

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CAREER ACTIVITIES IN SCIENCE

GRADES 7·8·9

BOISE SCHOOLS

BOISE IDAHO

PREFACE

The Career Exploration curriculum in this book was developed through a grant from the Idaho State Department of Vocational Education from March 11, 1974 through June 30, 1974. The activities were written by Boise Independent School District personnel.

The activities included are some of the ideas relating to careers which are being used to some degree in many classrooms. It is the purpose of this program to gather and develop many of these ideas and make them available to all seventh, eighth and ninth grade teachers in an integrated format within mathematics, science, language arts and social science.

Any one activity in the book might be used by a teacher or student without involving any other activities. They are designed to enrich the regular curriculum and can be "plugged in" where they seem appropriate. The cross-reference index will indicate grade, subject, career cluster, occupation and, in most instances, subject concept.

ACKNOWLEDGEMENTS

The activities in this guide were developed and written by the following Boise Independent School District personnel:

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DIRECTIONS FOR USE OF THIS GUIDE

The purpose of this guide is to help show relationships between school subjects and practical application through simulated activities. These activities are meant to be an enrichment supplement to the regular school curriculum, taught at those times when the instructor determines they are most applicable to that subject's concepts.

The activities were written to be used in four subject areas; mathematics, science, social sciences and language arts; and in grades seven, eight and nine. The intent is to involve all fifteen occupational cluster areas, as designated by the U. S. Office of Education, with these four subject areas in the three grade levels. They can be used as entire class activities, small group assignments or individual study.

The following pages contain cross-referencing of the activities in this guide:

Activity number with cluster, job and concept reference--pages ii through xiii.

Subject concepts with activity reference number--pages xiv through xvi.

Career Exploration Project
June 30, 1974

SUBJECT SCIENCE GRADE 7

#	CLUSTER	JOB AREA	SUBJECT CONCEPT
7	A 1 Home Economics & Consumer	Various	cleanliness
	A 2 Home Economics & Consumer	Various	disinfectants
	A. Home Economics & Consumer		
	A. Home Economics & Consumer		
	A. Home Economics & Consumer		
	B 1 Industrial Arts	Contractor Consumer Researcher	temperature alterations
	B 2 Industrial Arts	Carpenter Forester	hardwoods & softwoods
	B. Industrial Arts		

Career Exploration Project
June 30, 1974

SUBJECT SCIENCE GRADE 7

#	CLUSTER	JOB AREA	SUBJECT CONCEPT
7	B. Industrial Arts		
	B. Industrial Arts		
	C 1 Arts, Crafts, Humanities	Weaver, Dye Master	extraction of colors
	C 2 Arts, Crafts, Humanities	Weaver, Dye Master	extraction of colors
	C 3 Arts, Crafts, Humanities	Weaver, Dye Master	extraction of colors
	C 4 Arts, Crafts, Humanities	Weaver, Dye Master	extraction of colors
	C 5 Arts, Crafts, Humanities	Weaver, Dye Master	extraction of colors
	D. Business Occupations		

Career Exploration Project
June 30, 1974

SUBJECT SCIENCE GRADE 7

#	CLUSTER	JOB AREA	SUBJECT CONCEPT
7	E. Communications & Media		
	F. Hospitality & Recreation		
G 1	Environmental Control	Conservationist	water testing
	H. Personal Service		
	I. Manufacturing		
	J. Transportation		
K 1/2	Health Occupations	Medical Technician (a)	blood cells, blood types
K 3		Doctor, Nurse, Medic	blood cells, blood types
	L. Public Service		

Career Exploration Project
June 30, 1974

SUBJECT SCIENCE GRADE 7

#	CLUSTER	JOB AREA	SUBJECT CONCEPT
7	M. Agriculture & Natural Resources		
	N. Marine Science		
	O. Marketing & Distribution		
	P. Construction		
	Q. Miscellaneous Activities		

Career Exploration Project
June 30, 1974

SUBJECT SCIENCE GRADE 8

#	CLUSTER	JOB AREA	SUBJECT CONCEPT
8 A 1	Home Economics & Consumer	Laundry Worker	wetting property of water
A 2	Home Economics & Consumer	Nutritionist	analysis of a substance
A 3		Cook	acid & base indicators
A 4	Home Economics & Consumer	Dietitian	identifying an unknown
A 5	Home Economics & Consumer	Dry Cleaner	flammability
A 6	Home Economics & Consumer	Water Softener Salesman	insoluble precipitates
B 1	Industrial Arts	Fabricator	polymerization
B 2	Industrial Arts	Metal Worker	corrosiveness of acid
B 3	Industrial Arts	Metal Worker	temperature

Career Exploration Project
June 30, 1974

SUBJECT SCIENCE GRADE 8

#	CLUSTER	JOB AREA	SUBJECT CONCEPT
8 B 4	Industrial Arts	Sheet Metal Worker	heating, physical properties
B 5	Industrial Arts	Carpenter	simple machines
B 6		Foundry Worker	heating, physical properties
C 1	Arts, Crafts, Humanities	Jewelry Maker	volume
C 2	Arts, Crafts, Humanities	Potter	exactness in metric measurement
C 3	Arts, Crafts, Humanities	Interior Decorator	absorption & transmission of light
C.	Arts, Crafts, Humanities		
C.	Arts, Crafts, Humanities		
D 1	Business Occupations	Data Processor	interpretation of a model

Career Exploration Project
June 30, 1974

SUBJECT SCIENCE GRADE 8

#	CLUSTER	JOB AREA	SUBJECT CONCEPT
8 E 1	Communications & Media	Electronics Technician	electromagnetic induction
F.	Hospitality & Recreation		
G 1	Environmental Control	Filtration Engineer	filtration processes
H 1	Personal Service	Cosmetician	the chemical effect of a bleaching agent on protein
I 1	Manufacturing	Auto Manufacturing Worker	changes in the state of matter
J 1	Transportation	Mechanic	pressure exerted from the expansion of gases or liquids
K 1	Health Occupations	Health Occupations	antiseptics, disinfectants
K 2		Physician	resonance of sound
K 3		Physician	air pressure
L 1	Public Service	Meter Reader	electrical costs

Career Exploration Project
June 30, 1974

SUBJECT SCIENCE GRADE 8

#	CLUSTER	JOB AREA	SUBJECT CONCEPT
8	M 1 Agriculture & M 2 Natural Resources	Mining Engineer	replacement reaction
		Farmer	plant growth
	N 1 Marine Science	Oceanographer	accurate measurement of distance
	O 1 Marketing & Distribution	Quality Control	specific gravity
	P 1 Construction	Builder	compressibility of materials
	Q. Miscellaneous Activities		

Career Exploration Project
June 30, 1974

SUBJECT SCIENCE GRADE 9

#	CLUSTER	JOB AREA	SUBJECT CONCEPT
9 A 1	Home Economics & Consumer	Home Economist	colors of light represent energy
A 2	Home Economics & Consumer	Dietitian	calories
A 3	Home Economics & Consumer	Dressmaker , Purchasing Agent	fabric differences
A 4	Home Economics & Consumer	Teacher Candymaker Homemaker	scales
A 5	Home Economics & Consumer	Grocery Clerk Dietitian	speed & accuracy in weighing
B 1	Industrial Arts	Electrical Engineer Electrical Repairman	metric field for generating electricity
B 2	Industrial Arts	Drafting	latitude & longitude horizontal & vertical distances
B 3	Industrial Arts	Engineer	physical properties of metal

Career Exploration Project
June 30, 1974

SUBJECT SCIENCE GRADE 9

#	CLUSTER	JOB AREA	SUBJECT CONCEPT
9 B 4	Industrial Arts	Cement Contractor	materials making up products
B 5	Industrial Arts	Cabinet Maker	physical properties
C 1	Arts, Crafts, Humanities	Jewelry Maker	shape of a crystal
C 2	Arts, Crafts, Humanities	Photographer Art Designer	send a message with pictures
C 3	Arts, Crafts, Humanities	Jeweler	physical property of hardness
C 4	Arts, Crafts, Humanities	Photographer	basic camera tools: time, distance, f stop
C.	Arts, Crafts, Humanities		
D 1 D 2	Business Occupations	Custodian Salesman	moisture & body temperature power consumption & safety

Career Exploration Project
June 30, 1974

SUBJECT SCIENCE GRADE 9

#	CLUSTER	JOB AREA	SUBJECT CONCEPT
9 E 1	Communications & Media	Teacher	picture concepts help to communicate
F 1	Hospitality & Recreation	Guide	use of compass
G 1	Environmental Control	Fish Biologist	increased temperature increases chemical activity
H 1	Personal Service	Landscaper Gardener Caretaker	problems in landscaping
I 1	Manufacturing	Metallurgist	electrolytic cells
I 2		Production Specialist	liquids conduct electricity
J 1	Transportation	Dispatcher Ticket Agent Travel Bureau Manager	time differentiation
K 1	Health Occupations	Custodian Home Owner Nursery Supervisor	temperature variations
L 1	Public Service	Meteorologist	use of a barometer

Career Exploration Project
June 30, 1974

SUBJECT SCIENCE GRADE 9

#	CLUSTER	JOB AREA	SUBJECT CONCEPT
9 M 1	Agriculture & Natural Resources	Geologist, Prospector, Rockhound	identification of minerals
M 2		Soil Scientist	weathering of rock produces soil
M 3		Researcher, Air Monitor	air pollution
N 1	Marine Science	Marine Soil & Water Scientist	activities of interface between land & sea
O 1	Marketing & Distribution	Weather Consultant	weather bureau services
P 1	Construction	Engineer	gradient calculated from a contour map
Q.	Miscellaneous Activities		

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SCIENCE CONCEPTS

CONCEPT	ACTIVITY NUMBER		
	Grade 7	Grade 8	Grade 9
1. Acid & Base		8A[3]	
2. Air Pressure		8K[2]	
3. Blood Cells, Blood Type	7K[2]		
4. Calories			9A[2]
5. Chemical Effects		8H	9G
6. Color	7C[1],7C[2],7C[3],7C[4],7C[5]		9A[1]
7. Compressibility		8P	
8. Corrosiveness		8B[2]	
9. Distance		8N	
10. Electromagnetics		8E	
11. Electricity		8L	9B[1], 9I[1], 9I[2]
12. Disinfectants	7A[1], 7A[2]	8K[3]	

(continued)

Career Exploration Project
SCIENCE CONCEPTS

CONCEPT	ACTIVITY NUMBER		
	Grade 7	Grade 8	Grade 9
13. Filtration		8G	
14. Gases		8J	
15. Gravity		8O	
16. Hardness	7B[2]		9C[3]
17. Heating		8A[5], 8B[4], 8B[6]	
18. Identification of an Unknown		8A[4]	
19. Latitude & Longitude			9B[2]
20. Liquids		8J	9I[2]
21. Matter		8I	
22. Minerals			9M[1], 9M[2]
23. Metric Measure		8C[2]	
24. Physical Properties		8B[4], 8B[6]	9B[3], 9B[5]

(continued)

CONCEPT	ACTIVITY NUMBER		
	Grade 7	Grade 8	Grade 9
25. Plants		8M[2]	9H
26. Polymerization		8B[1]	
27. Scales & Measures			9A[4]
28. Shapes			9C[1]
29. Sound		8K[1]	
30. Substance		8A[2]	
31. Temperature	7B[1]	8B[3]	9D[1], 9G, 9K
32. Volume		8C[1]	
33. Water Testing	7G, 7K[1]	8A[1]	
34. Weather			9L, 9O
35. Weight			9A[5]

CLUSTER AREAS

The clusters used in this curriculum guide are those designated by the U. S. Office of Education plus one additional in Industrial Arts. The first three; Home Economics and Consumer Education; Industrial Arts; and Arts, Crafts and Humanities; each have five or more activities; whereas, the remaining clusters average one. One of the objectives of the project is to show more practical relationships between school subjects as well as subjects and occupations. This is the reason for the emphasis on the first three clusters which are also subject areas in the junior high years.

The clusters used in this curriculum for all three grade levels are:

a) Home Economics and Consumer Education
b) Industrial Arts
c) Arts, Crafts and Humanities
d) Business Occupations
e) Communications and Media
f) Hospitality and Recreation
g) Environmental Control
h) Personal Services
i) Manufacturing
j) Transportation
k) Health Occupations
l) Public Services
m) Agriculture and Natural Resources
n) Marine Science
o) Marketing and Distribution
p) Construction

CAREER EXPLORATION ACTIVITIES

CLUSTER AREAS	NUMBER OF ACTIVITIES BY SUBJECT AREA AND GRADE LEVEL												
	MATHEMATICS			SCIENCE			LANGUAGE ARTS			SOCIAL SCIENCE			TOTAL
	7	8	9	7	8	9	7	8	9	7	8	9	
A CONSUMER AND HOME ECONOMICS	5	6	5	2	6	5	7	4	5	3		5	53
B INDUSTRIAL ARTS	6	6	6	3	6	5	4	4	4	7	5	6	62
C ARTS, CRAFTS AND HUMANITIES	5	5	5	5	3	4	6	5	4	5		6	53
D BUSINESS OCCUPATIONS	1	1	1		1	2	1	3	2	1	1	1	15
E COMMUNICATIONS AND MEDIA					1	1	2	2	2	1	1	3	13
F HOSPITALITY AND RECREATION	1	1	1			1	1	1	1	1	1	1	10
G ENVIRONMENTAL CONTROL				1	1	1	2	1	1	1		1	9
H PERSONAL SERVICE	1	2			1	1	3	2	1	2	1	1	15
I MANUFACTURING	3	2	2		1	2		1	1	2		1	15
J TRANSPORTATION	1	1	3		1	1	2	1	1		2	2	15
K HEALTH OCCUPATIONS	2	2	2	3	3	1	1	2	1	1	2	1	21
L PUBLIC SERVICE			2		1	1	3	5	2	1	1	4	20
M AGRICULTURE AND NATURAL RESOURCES	1	1	1		2	1	2	1	1	3	1	3	17
N MARINE SCIENCE	1	1	2		1	1	1		1	1	1	3	13
O MARKETING AND DISTRIBUTION	2	1	2		1	1	2	1	2	1		2	15
P CONSTRUCTION	1	2	2		1	1	1	1	1			2	12
Q MISCELLANEOUS							2	1					3
TOTALS	30	31	34	14	30	29	40	35	30	30	16	42	361

APPENDIX A

GRADE 7-A

SUBJECT Science

CLUSTER Health Services or Home Economics

JOB TITLE Waitress, Chef, Cook, Medic, Nurse, Surgeon, Housewife, Housekeeper, Dietitian, Home Economist, County Health Inspector

CONCEPT

Cleanliness

PERFORMANCE OBJECTIVE

Students will be able to give five reasons in writing why good laboratory techniques and cleanliness are essential in a science experiment.

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ACTIVITY

1

I. SITUATION--What You Don't See Is What You've Got!

When the lunch bell rings, Seth races to his locker to grab is lunch. Lunch sack in hand, he races down the hall to the cafeteria. He sits down at a table and starts eating lunch. Seth forgot to wash his hands...Does it really matter?

II. STEPS

1) Obtain two clean petrie dishes with covers from your teacher. (Teacher: use an autoclave to clean and sterilize the petrie dishes. You might find one at a local hospital, college or,possibly,high school science class.)

2) Warning: DO NOT TOUCH THE INSIDE OF YOUR PETRIE DISHES!!

3) Tear two pieces of masking tape and place one on each of the petrie dish covers.

4) With a pen, label one of the strips of tape "Dirty Hands". On the other strip write "Clean Hands".

5) In the petrie dish labeled "Dirty Hands", pour enough agar solution to cover the bottom of the dish.

6) Use your dirtiest finger and lightly touch the agar solution two or three times in different places. (If you have dirt under your fingernails, add that too.)

7) Put the "Dirty Hands" cover on the petrie dish and place it in a safe place for two or three days.

8) Wash your hands and clean your fingernails THOROUGHLY! (continued)

RECOMMENDATIONS

Check a biology book or A Source Book for Biological Science by F. Morholt, pub. by Harcourt, Brace & World, 1966 for agar solution formula.

MATERIALS

Per group: 2 clean petrie dishes, 2 clean glass slides, 2 clean coverslips, 2 toothpicks, masking tape and ink pen, soap, paper towels (to dry hands), agar solution, India ink solution

MATERIALS

GRADE 7-A

SUBJECT Science

CLUSTER Health Services or Home Economics

JOB TITLE Waitress, Chef, Cook, Medic, Nurse, Surgeon, Housewife, Housekeeper, Dietitian, Home Economist, County Health Inspector

II. STEPS

9) Repeat steps #5-#7,only this time use "Clean Hands".

10) After two or three days, whitish clumps should be visible on the agar in the "Dirty Hands" petrie dish. With a toothpick, remove several of these clumps and place on a clean slide.

11) Add a couple of drops of a very dilute solution of India ink to the bacteria on the slide. The ink is to be used as a reverse stain. It will stain the background, making the light-colored bacteria more visible.

12) Place a coverslip on top of the bacteria.

13) Place the slide under a microscope and take a good look!

14) Repeat steps #10-#13 for the petrie dish labeled "Clean Hands".

GRADE 7-A 2

SUBJECT Science

CLUSTER Health Science
Home Economics

JOB TITLE Housekeeping (in hosp.)
Homemaker, Food Service
Medic, Doctor, Nurse,
Nurse-Practitioner,
Medical Technician,
Custodial Engineer

CONCEPT

Disinfectants

PERFORMANCE OBJECTIVE

Students will be able to explain orally or in writing several differences in the varieties of bacteria and mold.

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RECOMMENDATIONS

Autoclave the petrie dishes and jars after you are done.

ACTIVITY Page 1 of 2

3

I. SITUATION--Molds, Bacteria and Disinfectants

This activity is designed to demonstrate exactly what disinfectants are capable of doing. will also show that it is often best to rely on several disinfectants rather than just one.

II. STEPS

1) Place a small amount of each of the following in uncovered petrie dishes:
   a) vinegar
   b) strong coffee
   c) bread
   d) cheese
   e) any other substance that could serve as a growth medium

2) Leave these substances uncovered until a mold or bacteria growth occurs. (You should keep a record of how long it takes each substance to produce mold or bacteria.)

3) When mold or bacterial growth occurs, cover the petrie dish.

4) Leave the petrie dish in a safe place until the growth is well developed.

5) With forceps or eyedropper, place a bit of each mold or bacteria on a slide. Do not place more than one mold or bacteria on a slide.

6) Draw a picture of each mold or bacteria.

7) Label three jars for each substance as follows:
   a) Vinegar mold in soapy water

(continued)

MATERIALS

MATERIALS

GRADE 7-A

SUBJECT Science

CLUSTER Health Sciences or Home Economics

JOB TITLE Housekeeping (in hosp) Homemaker, Food Service, Medic, Doctor, Nurse, Nurse-Practitioner, Medical Technician, Custodial Engineer

II. STEPS

7) b) Vinegar mold in ammonia
c) Vinegar mold in Lysol

8) Divide the vinegar mold into three equal parts and pour into each jar.

9) Pour a small amount of the required disinfectant in each of the three jars and cover with lids.

10) Do the same for the rest of the molds and bacteria.

11) Let them sit overnight. The next day, take a sample from each jar and check to see how many have been killed.

12) Perhaps you might want to check them again the following day to see if the results are the same.

GRADE 7 - B

SUBJECT Science

CLUSTER Industrial Arts

JOB TITLE Contractor

Consumer Researcher

CONCEPT

temperature alterations

PERFORMANCE OBJECTIVE

1. Student should be able to take accurate temperature readings.
2. Student should be able to determine volume.
3. Student should be able to do consumer research.
4. Student should be able to share information to choose an air conditioner based on data they have obtained.

RECOMMENDATIONS

Make "Consumer Report" magazine available to students (issue on air conditioners).

Air Circulation & Air Condtioners

I. SITUATION

It's hot! We need an air conditioner! It's mid-afternoon in Room 107. All the windows are wide open...Yet the heat just hangs in the air. An air conditioner is due to be installed next week. Where should it be installed? Should it be installed at floor level, near the ceiling, or somewhere in between?

II. STEPS

You have 3 jobs that need to be done.
(A) Find volume of the room.
(B) Take temperatures of air.
(C) Investigate air conditioners.

1. You will need the temperature taken at at least 3 different altitudes to determine how greatly the temperature varies in the room.
2. Start on the warmest side of the classroom. Using a thermometer and standing on a chair, try to take the temperature of the air as close to the ceiling as possible. Hold the thermometer over your head for 3 - 5 min. Record the temperature.
3. This time, stand on the floor and hold the thermometer over your head for 3 - 5 min. Record the temperature.
4. Finally sitting on the floor, take the temperature about 1 foot off the ground.
5. Repeat steps 2-4 at 2 other places in the room.

(CONTINUED)

MATERIALS thermometer paper & pencil meter stick (measure volume)
Consumer Reports magazine

MATERIALS

GRADE 7 - B

SUBJECT Science

CLUSTER Industrial Arts

JOB TITLE Contractor

Consumer Researcher

CONCEPT

PERFORMANCE OBJECTIVE

RECOMMENDATIONS

ACTIVITY

I. SITUATION

II. STEPS

6. Record data and decide which part of the room to install your air conditioner... Also decide how far it should be from the ceiling or floor for the air conditioner to be the most effective.
7. While steps 1-6 are taking place, you could have a group measure the room and find volume, as well as having another group reading up on air conditioners. They should choose an airconditioner based on the price, warranty, and the amount of electricity consumed, etc.

MATERIALS

GRADE 7 - B²

SUBJECT Science

CLUSTER Industrial Arts

JOB TITLE Carpenter, Forester

ACTIVITY Hardwood & Softwood

I. SITUATION

The terms "hardwood" and "softwood" are used frequently, but very few people understand exactly what the terms mean. Here's a chance to learn first hand.

CONCEPT

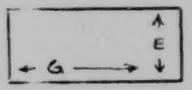
Hardwoods & softwoods

PERFORMANCE OBJECTIVE

The student should be able to understand the difference between hard and soft wood.

II. STEPS

1. Teacher: cut up a piece of hardwood, and piece of softwood into blocks.
2. Label the hardwood blocks "A". Label the softwood blocks "B".
3. Draw 2 lines on the block and label them "E" and "G":



   Clamp blocks to the edge of a desk.
4. Have the students cut along both lines with a coping saw. They should discover that it is easier to cut along one line, (the grain) than the other.
5. Students should also notice that one piece of wood (block "B") is easier to cut.
6. Discuss the uses of hard and softwood, in building, paper, paper products, etc.

RECOMMENDATIONS

If you can get sawhorses, use them. Otherwise, watch out for your desks.

MATERIALS (per group): 1 pc hardwood (maple, oak) 1 pc softwood (pine, cedar)
1 coping saw 1 "U" clamp
(to clean up): 1 broom, 1 dust pan

MATERIALS

GRADE 7 - C

SUBJECT Science

CLUSTER Arts, Humanities

JOB TITLE Weaver, Macrame Instructor

Dye Master

ACTIVITY

Gray Dye from Blackberries.

I. SITUATION

Another chance to experiment with dyeing.

CONCEPT

Extraction of colors

PERFORMANCE OBJECTIVE

Student should be able to identify plant and then collect it to make dye to dye his yarn.

II. STEPS

FOR MORE DETAILS, REFER TO BURNT ORANGE DYE FROM ONIONS.

1. Mordant: Alum
2. To prepare dye: Boil 1 pound of young blackberry shoots for 45 min. Strain liquid into bath for dye.
3. To dry wool: Immerse wool when dye bath is lukewarm, bring to a boil and simmer 1 hr. If a darker gray is desired, lift wool out and add ½ oz of iron (ferrous sulfate) to the dye bath. Mix in well; return wool and continue simmering until the shade desired is obtained. Rinse and dry.

RECOMMENDATIONS

Dye could also be used to dye candles.

MATERIALS: See other dying projects

OPTIONAL: ferrous sulfate

MATERIALS

GRADE 7 - C2*

SUBJECT Science

CLUSTER Arts - Humanities

JOB TITLE Weaver, Macrame Instructor
Lye Master

ACTIVITY
Yellow-Green Dye from Bracken Fern

I. SITUATION

Bracken fern is a coarse fern found nearly everwhere. It works best for dyeing at the "fiddle-head stage" in spring when the young shoots are still coiled at the tip.

CONCEPT

Extracting colors.

PERFORMANCE OBJECTIVE

Student should be able to identify and collect bracken fern.

Student should be able to follow directions, measure ingredients, and produce a dye.

Student should be able to use dye to dye yarn or candles.

II. STEPS

Collect 1 lb. of bracken fern.

1. Mordant: alum
2. To prepare dye: steep 1 lb of young shoots in hot water for 2 hrs. Strain liquid into bath for dye.
3. To dye yellowish-green: Enter mordanted, wetted material into lukewarm dye bath. If wool, simmer one hour.

RECOMMENDATIONS

MATERIALS: dye pot or kettle of copper, stainless steel or enamelware
scales for weighing yarn or plant parts cooking thermometer
2 Pyrex pitchers (pt & qt) plastic spoons for adding mordants
glass rods for stirring (if wood spoons are used, use a different one for each color)
buckets for rinsing wool yarn (1 lb) alum (potassium alum)
cream of tartar strainer

MATERIALS

GRADE 7 C 3

SUBJECT Science

CLUSTER Arts, Humanities

JOB TITLE Weaver, Macrame Instructor
Dye Master

ACTIVITY
Tan Dye from Lichen

I. SITUATION

Lichen is rather common and can easily be obtained from dead trees. It is bright lime green in color here in Idaho.

CONCEPT

Extracting colors

PERFORMANCE OBJECTIVE

Student should be able to identify and collect lichen.

Student should be able to follow directions, measure ingredients and produce a dye.

Student should be able to use dye to dye yarn or candles.

II. STEPS

Collect 1 peck of lichen.

1. Mordant: Alum
2. Prepare dye: Soak one peck of lichen overnight. Boil one hour and strain liquid into water bath for dye.
3. To dye yellowish tan: Enter alum-mordanted and wetted wool when dye bath is lukewarm. Continue heating to a boil, then simmer half an hour or longer. Rinse as usual and dry wool in shade.
4. To dye rose tan: After 30 min. of simmering, remove wool and without rinsing, put it into a hot bath containing 1/6 oz potassium dichromate and 1/6 oz acetic acid. Simmer 15 min. then rinse and dry.

RECOMMENDATIONS

Dye could be used to dye candles.

MATERIALS: dye pot or kettle of copper, stainless steel or enamelware; scales for weighing yarn or plant parts; cooking thermometer; 2 Pyrex pitchers(pt/qt plastic spoons for adding mordants; glass rods for stirring (if wood spoons are used use a different one for each color); buckets for rinsing; wool yarn (1 lb); alum (potassium alum); cream of tartar; strainer; OPTIONAL: potassium dichromate and acetic acid.

MATERIALS

GRADE 7 - C 4
C
SUBJECT Science

CLUSTER Art, Humanities

JOB TITLE Weaver, Macrame Instructor
Dye Master

CONCEPT

Extraction of color

PERFORMANCE OBJECTIVE

Student should be able to follow directions and obtain naturally dyed wool yarn for art projects.

34

ACTIVITY

I. SITUATION

Lime Yellow dye from lombardy poplar leaves (Populus nigra italica)

Here's another dye to try!

II. STEPS

1. You will need to collect 1½ pecks of leaves.
2. Chop 1½ pecks of leaves and soak overnight. Heat gradually and boil 45 min - 1 hr. Strain liquid into pan to be used for dye bath.
3. Wash yarn according to directions in BURNT ORANGE activity.
4. Prepare mordant according to directions in BURNT ORANGE DYE FROM ONIONS.
5. If you do not have at least 30 min. left to work, then wrap yarn in towel & put it in a cool dark place to dry. If you have 30 min. or more left, proceed to Step 6.
6. Place wet yarn into lukewarm dye bath (if yarn is dry then wet it!!) Heat to boiling point and simmer until color is right. Rinse several times.
7. Dry in the shade.

RECOMMENDATIONS

Read through the directions for BURNT ORANGE DYE FROM ONIONS before trying.

MATERIALS: See BURNT ORANGE DYE FROM ONIONS.

MATERIALS

GRADE 5

SUBJECT Science

CLUSTER Art, Humanities

JOB TITLE Weaver, Macrame Instructor

Dye Master

ACTIVITY

Burnt Orange Dye from Onions (Allium sepa)

I. SITUATION

There is a renewed interest in natural dyes, foods, and lifestyles. Here's an activity your class might enjoy.

CONCEPT

Extracting color

PERFORMANCE OBJECTIVE

Student should be able to follow directions and obtain naturally dyed wool yarn for art projects.

II. STEPS

You will need 1 pound of onion skins so ask the cafeteria to save them for you. Only the papery brown skins of the common cooking onion are to be used. Potassium aluminum sulfate alum (potassium alum) will be used as a 'fixing' agent. You will also need 1 pound of white yarn.

1. Remove paper label from yarn but DO NOT UNTIE IT. (Yarn will be easier to handle and won't tangle if it remains in a bundle or skein)
2. Washing instructions: Some wool yarns still contain lanolin (an oil) and must be washed. Use mild soap flakes. DO NOT USE A DETERGENT.
3. After yarn is washed rinse several times. If you do not have 1 hr. left of class then wrap yarn in a towel and let it dry overnight.

(CONTINUED)

RECOMMENDATIONS

Alum & cream of tartar can be purchased from a drug store. If dye bath has cooled off by the time the mordant's ready, then reheat. Dye bath may need reheating for 2nd & 3rd dipping of yarn.

MATERIALS: dye pot or kettle of copper, stainless steel or enamelware; scales for weighing yarn or plant parts; cooking thermometer; 2 Pyrex pitchers (pt/qt) for liquid measures; plastic spoons for adding mordants; glass rods for stirring; buckets for rinsing; 1 lb. wool yarn; alum (pot.alum); cream of tartar; strainer.

MATERIALS

GRADE 7 - C 5

SUBJECT Science

CLUSTER Art, Humanities

JOB TITLE Weaver, Macrame Instructor
Dye Master

ACTIVITY Page 2 of 2

I. SITUATION

CONCEPT

PERFORMANCE OBJECTIVE

II. STEPS

3. If you have an hour or more left, go to step 4.
4. Prepare Mordant: a. Prepare a water bath of 4-4½ gal. of soft water. Heat water until it is warm to the touch. Dissolve completely 3 oz. of alum and 1 oz of cream of tartar in a small quantity of water and add to the water bath. Wet wool thoroughly (squeeze out excess water) and place it in water bath. With spoon or glass rod, spread out yarn and also stir water bath. Raise the temperature gradually over a one hour period. DO NOT BOIL the water (Keep temperature below 212° F, which is the boiling point of water....use thermometer and watch temp.) b. Simmer for an hour, turning the yarn from time to time with a spoon or glass rod.
5. Remove yarn from water bath. Wrap yarn in towel and let it dry in a cool place overnight.
6. Prepare Dye Bath: Boil one pound of onion skins 30 min. Strain liquid into a large plastic bucket or dish pan.
7. Moisten wool with water (if it is dry). Place wet yarn in hot dye bath and let it steep for 1 hour. Remove the yarn and rinse * it in hot water, later use warm and cool water. Let it dry. If a deeper color is desired, dip the wool in the dye several times, drying it after each dipping.

RECOMMENDATIONS

Students might be allergic to some of the dyes. Caution them to use glass rods or wood spoons.

* If a thin (2 ply) yarn is used, decrease the amount of alum and cream of tartar used or yarn will feel sticky.

MATERIALS

GRADE -G

SUBJECT Science

CLUSTER Environmental Control

JOB TITLE Conservationist

CONCEPT

Clear water may contain minerals from the land.

PERFORMANCE OBJECTIVE

ACTIVITY

I. SITUATION--Testing Water for Minerals

Many people are concerned about soil erosion and sediments in water. Do they know that clear streams carry minerals to the sea in large quantities?

II. STEPS

1) Collect samples of water from:
   a) river
   b) canal
   c) irrigation ditch
   d well
   e) city water
   e) rain or snow water
   f) lake or pond
   g) any other available source

2) Mark each sample and run it through filter paper.

3) Evaporate each sample in a clean pyrex dish. Observe the residue.

4) Dissolve salt(halite), gypsum and lime in 250ml of water. Heat if necessary to help dissolve. Filter each solution to eliminate undissolved material.

5) Evaporate a sample of each in a pyrex dish and record the results.

6) Make a mixture of the three samples and evaporate again. Does it appear as if the minerals are partly separated by evaporation?

RECOMMENDATIONS

Filmstrip and record: "The Evaporites", Brittanica film from the set Rocks & Minerals

MATERIALS

Water samples, pyrex evaporating dishes and beakers, filter paper, funnels, ring stands, source of heat

MATERIALS

GRADE 7-K'

SUBJECT Life Science

CLUSTER Health Science

JOB TITLE Medical Technician, Doctor, Nurse, Medic, Nurse-Practitioner

CONCEPT

PERFORMANCE OBJECTIVE

Students will be able to make and stain a blood smear. Also, students will be able to draw and label a red blood cell.

ACTIVITY

I. SITUATION--Blood Smear

John has been feeling rather tired lately. His doctor suspects that he is not getting enough iron. If this is true, his blood will not have very many round blood cells. His blood cells will probably be misshapen.

II. STEPS

1) Jab middle finger with clean (to avoid infection) stylet and squeeze finger, if necessary, to draw blood.

2) Place a medium-sized drop of blood near one end of a clean slide.

3) Place spreader slide in front of drop at an angle of 45°.

4) Move slide backward until it touches drop. Drop should spread slightly.

5) Move spreader slide rapidly to the end of the bottom slide.

6) Leave on table until dry.

7) When slide is dry, use eyedropper to add enough Wright's Stain to cover blood smear on slide. Place slide under microscope and observe cells.

8) Draw a picture of a blood cell. Label the following parts of the cell:
   a) vacuole
   b) nucleus
   c) cell wall

RECOMMENDATIONS

MATERIALS

2 clean slides (per person). 1 bottle of Wright's Stain (per class), microscope, unlined paper, stylet, eyedropper
Optional: use buffer to make cells more visible

MATERIALS

GRADE ●-K 2

SUBJECT Science

CLUSTER Health Science

JOB TITLE Medical Technician, Doctor, Nurse, Medic, Nurse-Practitioner

CONCEPT

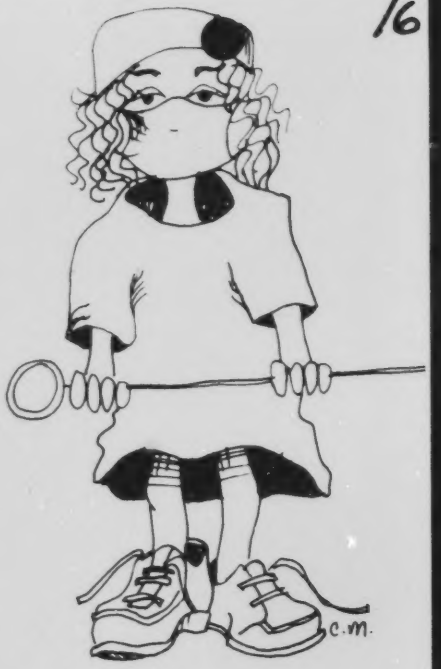
PERFORMANCE OBJECTIVE

Student will be able to test urine and determine by the use of a color-coded chart whether a person is diabetic and to what degree.

ACTIVITY ●

I. SITUATION--Blood Sugar Test

Connie is constantly tired and has no energy; however, she is not iron deficient. Last week, she cut herself while making a salad. Her cut has still not healed. Perhaps, she is diabetic. Let's run some tests and see. If there is sugar in her urine, then she is diabetic. Sugar in the urine indicates that the cells are not getting the energy they need.



II. STEPS

1) Obtain urine sample from a normal person and a diabetic. If a urine sample cannot be obtained from a diabetic, make up a 5% glucose solution (5ml glucose and 95ml H_2O) and add yellow food coloring.

2) Label the sample from the normal person "Normal". Label the sample from the diabetic person "Diabetic".

3) Dip Clinistix or Tes-Tape in the "Normal" sample and remove. With another Clinistix or Tes-Tape, do the same with the "Diabetic" sample.

4) Match the color of Clinistix or Tes-Tape with the right color on the color chart.

RECOMMENDATIONS
If urine samples are to be used, have a brief talk or discussion about human excrement not being dirty!

MATERIALS
2 pieces of Tes-Tape or 2 Clinistix (per person); urine samples or glucose solutions (5% or others) and yellow food coloring

MATERIALS

GRADE 7-K 3

SUBJECT ~~Science~~

CLUSTER Health Services

JOB TITLE Doctor, Nurse, Medic, Medical Technician, Nurse-Practitioner

CONCEPT

PERFORMANCE OBJECTIVE

Each student will be able to obtain a blood sample and type his/her own blood.

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ACTIVITY

I. SITUATION--Blood Typing and Rh Factor

John and Beth are getting married. They have to have blood tests to see if either of them are carrying any diseases. In case they have children, they should know if their blood types are compatible, since children inherit their blood types from their parents.

II. STEPS

1) With a grease pencil, draw 3 circles on a clean lide. Label the circle on the left "A", the middle circle "B" and the circle on the far right "Rh".

2) Take a clean (to avoid infection) stylet and prick your middle finger.

3) Place a drop of blood in each of the 3 circles.

4) Put a drop of anti-A serum in circle"A". Tak a clean toothpick and mix gently. If it coagulates, you have type "A" blood.

5) Put a drop of anti-B serum in circle "B". Use a clean toothpick and mix gently. If it coagulates, you have type "B" blood.

6) If you got no reaction in circle "A" or "B", then you have type "O" blood.

7) Put a drop of anti-Rh (anti-D) in the circle labeled "Rh" and mix. If it coagulates, then you have Rh+ (positive) blood.

RECOMMENDATIONS

Add anti-A, anti-B and anti-Rh (D) BEFORE blood dries.

MATERIALS

Per person: clean slide, stylet, grease pencil (or masking tape and pen for labeling slides), anti-A serum, anti-B serum, anti-Rh (anti-D) serum, 3 eyedroppers (if serum doesn't have attached eyedroppers)

MATERIALS

GRADE [redacted] A'

SUBJECT Science

CLUSTER Home Ec & Consumer Ed.

JOB TITLE Laundry Worker

CONCEPT

Observing the wetting property of water.

PERFORMANCE OBJECTIVE

The student can observe the different absorption or wetting rates of water on material and indicate which one of the sinking samples would be washed the fastest.

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ACTIVITY Sinking [redacted]ulose

I. SITUATION

One of the big advantages that detergents have over soap is the fact that they increase the wetting property of water. But, a laundry substance that decreases this wetting property is a fabric softener. They actually make the fabric somewhat waterproof. This is a disadvantage when washing towels.

II. STEPS

1. Pour a small amount of fabric softener into a small beaker and soak a non-absorbent piece of cotton in it. Remove the cotton and allow to dry.
2. Fill three 100 ml graduated cylinders with water.
3. Add a small amount of detergent to one of the cylinders and stir thoroughly.
4. Place a piece of non-absorbent cotton into the detergent cylinder, one into the plain water cylinder and the fabric softener treated one into the third.
5. The race is on. Observe and record the time required for each sample to sink.

RECOMMENDATIONS

MATERIALS three pieces of wool, yarn, or nonabsorbent cotton, three graduated cylinders, detergent, timing device such as a watch.

MATERIALS

GRADE 8-A 2

SUBJECT Science

CLUSTER Home Economics & Consumer Education

JOB TITLE Nutritionalist

CONCEPT

Analysis of a substance

PERFORMANCE OBJECTIVE

The student will break down milk into its major constituents, list the results and tell what makes each part important to our health.

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ACTIVITY

I. SITUATION--Mad About Milk

A substance such as milk is made up of many types of materials. Milk can be broken down into:

1) Casein
2) Whey
   a) Protein
   b) Albumin
3) Milk sugar and carbohydrates, vitamins and minerals

The student can separate these substances from milk.

II. STEPS

1) Heat 50 ml of milk, but do not boil it

2) Add a spoonful of white vinegar while stirring. A solid curd is formed which is a protein mixture called casein.

3) Strain the mixture through filter paper placed over a 250 ml beaker. The liquid obtained is whey.

4) Boil the whey and filter. The light curds that formed and are on the filter paper are protein and albumin.

5) Evaporate the liquid in an evaporating dish. The solid remaining is milk sugar, carbohydrate, water soluable vitamins A, B, C, D, E, K and the minterals K, Ca P, Na S.

6) Have the students list the substances formed and their appearances and write short statements as to their importance to our health.

7) Optional: The protein obtained in step #4 can be identified by adding a few drops of nitric acid which yields a yellow color.

RECOMMENDATIONS

MATERIALS

Hotplate or stove, 2 250 ml beakers, evaporating dish, white vinegar, non-homogenized milk, filter paper

MATERIALS

GRADE 8-A3

SUBJECT Science

CLUSTER Home Economics and Consumer Education

JOB TITLE Cook

ACTIVITY

I. SITUATION--Colors and Cooking

The presence of a strong base or acide while cooking can cause undesirable color changes since some foods act as chemical indicators. Also, there could be a breakdown of the nutrients involved.

CONCEPT

Acid and base indicators

PERFORMANCE OBJECTIVE

Using materials found in a kitchen, the student can identify a base from an acid using red cabbage as a chemical indicator.

II. STEPS

1) Chop up some red cabbage very fine.

2) Boil the cabbage in water.

3) Separate the cabbage from the liquid, using a strainer or paper towels.

4) Divide the liquid obtained into two portions.

5) Test one portion with vinegar. It would turn a bright red color indicating the presence of an acid.

6) Also test the portion with blue litmus which should confirm the presence of an acid.

7) Test the other portion with ammonia. It should turn a bright green color indicating a base.

8) Confirm the presence of a base using red litmus which should turn blue.

RECOMMENDATIONS

MATERIALS

Red cabbage, 3 250ml beakers, hotplate,vinegar, ammonia, blue and red litmus paper

MATERIALS

GRADE 8-A4

SUBJECT Science

CLUSTER Home Economics & Consumer Education

JOB TITLE Dietitian

CONCEPT

Identifying an unknown

PERFORMANCE OBJECTIVE

Given a series of chemical tests, the student will be able to use them on unknowns and identify the presence of a protein, vitamin C, starch or sugar.

44

ACTIVITY

21

I. SITUATION--What's for Dinner?

Nutritional foods are a must for the proper growth of an active teenager. In this activity, the student will be given a number of nutritional substances and asked to identify them through the use of chemical tests.

II. STEPS

1) First the student must be given the chemical tests, which are as follows:

a) Protein: Place a few drops of nitric acid on the sample. A yellow color is an indicator.

b) Vitamin C: Place 10ml of 0.1% solution of indophenol into a test tube. Add the unknown drop by drop using a medicine dropper until the solution changes color. Vitamin C makes indophenol colorless.

c) Starch: Test by adding a drop of iodine. A bluish-black color is a positive test.

d) Sugar: Place 5ml of Benedicts solution into a test tube and add a few drops of the unknown. Bring to a boil. The color change indicates the presence of sugar.

2) Give the student samples of unknowns in four numbered test tubes. The following unknowns are suggested:

a) Egg white: protein
b) White sugar (in water solution): sugar
c) Potato: starch
d) Orange juice: vitamin C

(continued)

RECOMMENDATIONS

MATERIALS

Egg white, orange uice, potato, white sugar, nitric acid, 0.1% indophenol solution, iodine solution, Benedicts solution, 4 medicine droppers, 8 test tubes, test tube holder, alcohol burner

MATERIALS

GRADE 8-A4

SUBJECT Science

CLUSTER Home Economics & Consumer Education

JOB TITLE Dietitian

II. STEPS

3) Using four empty test tubes, place a sample of each unknown into each and test.

4) After each test, clean the test tubes and repeat the testing on the next unknown.

5) When the unknowns are identified, write them down with their respective numbers and check the accuracy with the teacher.

GRADE 8-A5

SUBJECT Science

CLUSTER Home Economics and Consumer Education

JOB TITLE Dry Cleaner

CONCEPT

Flammability of materials

PERFORMANCE OBJECTIVE

The students will be able to treat fabric made from plants, animals and man-made material with fire retardant. From observations of flame tests, he/she will be able to compare the flammability between treated and untreated cloth.

46

ACTIVITY Burn, Cloth, Burn!

I. SITUATION

The 1954 Flammability Fibers Act requires that any fabric that burns more than two seconds after the flame is removed must be treated with retardants. Some natural fibers are natural retardants, such as mineral fibers and asbestos. Others, such as protein fibers and some thermoplastics ignite slowly and burn only a brief time, but cause severe burns.

II. STEPS

1) Obtain two small (approximately 2"X2") swatches of:
   a) cotton or linen
   b) wool or silk
   c) polyester or nylon

2) Prepare the retardant by mixing 84 grams of boric acid and 200 grams of Borax and dissolving the mixture in 2 liters of warm water.

3) Dip one each of the three different types of material swatches in the retardant and hang it up to dry.

4) Pin a swatch of treated an untreated cotton or linen to a ring holder on a ring stand.

5) Apply a flame to each and record the results.

6) Repeat steps #4 and #5 using wool or silk and polyester or nylon, and also record the results.

RECOMMENDATIONS

Students should keep well away from burning untreated cloth since the synthetic material melts in a flame.

MATERIALS

Boric acid, Borax, 3 250ml beakers, 1 100ml or larger graduated cylinder, 1 balance, swatches of material, ring holder and ring stand, alcohol lamp

MATERIALS

GRADE 8-A 6

SUBJECT Science

CLUSTER Home Economics & Consumer Education

JOB TITLE Water Softener Salesman

CONCEPT

Insoluable precipitates

PERFORMANCE OBJECTIVE

The students will be able to explain the process and results of the experiment as outlined in the activity.

27

ACTIVITY

I. SITUATION--Scum, the Villian

Hard water contains dissolved minerals, usually calcium and magnesium, which, when combined with soap, make a scum that is difficult to remove from clothing. Also, some of the soap unites with the minerals and more soap is required. The scum, insoluable precipitate, can be observed in this activity.

II. STEPS

1) Obtain hard water either:
   a) from the tap
   b) by dissolving 25 grams of calcium chloride in 250 ml of distilled water.

2) Place 125 ml of hard water in two test tubes.

3) Add several drops of liquid soap (not detergent) to one test tube and shake vigorously.

4) Soften the water in the second tube by dissolving one teaspoon of washing soda.

5) Add several drops of liquid soap to the second tube and shake rapidly.

6) Filter each test tube and observe the difference. The hard water and soap forms an insoluable precipitate, scum.

RECOMMENDATIONS

MATERIALS

Calcium chloride, distilled water, liquid soap, filter paper, 2 test tubes, 2 small jars or beakers, washing soda

MATERIALS

GRADE 8 - B'

SUBJECT Science

CLUSTER Industrial Arts

JOB TITLE Fabricator

CONCEPT

Polymerization - the building of long chains of molecules from smaller ones.

PERFORMANCE OBJECTIVE

The student will fabricate a light switch cover plate using a foam that increases in size dramatically. He will observe and describe the effect of polymerization.

ACTIVITY The Old Rigid Foam Trick

I. SITUATION

Many products today are fabricated by injection molding. A liquid material is forced, under pressure, into a mold and allowed to harden. The material used in this activity is a polyether base urethane resin. When the two liquids are mixed, a polymerization reaction gives off heat which in turn releases freon gas giving pressure and increasing the volume 20 to 30 times.

II. STEPS

1. With ¼" plywood, build a 3" x 5" x 1" open top box frame.
2. Warm the polymer to 90° - 100° F by placing the capped bottle under warm, then hot water for a few minutes. Do not warm the activator.
3. Pour equal amounts (about 20cc each) of polymer and activator into the frame and stir until the color changes from amber to white and foaming commences.
4. Place a light switch cover, coated with grease, on top of the frame, cover with another piece of plywood and clamp together with C clamps.
5. Foaming should be quite rapid, but allow to cool for 25 to 30 minutes.
6. Remove the light switch cover and grease the mold that was obtained.
7. Add more of the activator and polymer (about 5-8cc) and mix in the mold.
8. When the color changes and foaming starts to occure, cover and clamp again.

(CONTINUED)

RECOMMENDATIONS

MATERIALS

¼" plywood scraps	brads or sm. nails	hammer
saw	graduated cylinder	thermometer
two C clamps	cooking grease	light switch cover
enamel paint if desired		

Rigid Foam Kit is available from Frey Scientific, 4655 Diamond St., Mansfield, Ohio 44903 @ $3.95

MATERIALS

26

GRADE 8 - B[1]

SUBJECT Science

CLUSTER Industrial Arts

JOB TITLE Fabricator

ACTIVITY

I. SITUATION

CONCEPT

II. STEPS

9. Allow to cool and remove the fabricated light switch cover.
10. The cover can be painted with enamel to any desired color.

PERFORMANCE OBJECTIVE

67

RECOMMENDATIONS

MATERIALS

GRADE 8 - B 2

SUBJECT Science

CLUSTER Industrial Arts

JOB TITLE Metal Worker

CONCEPT

Corrosiveness of acid on a metal.

PERFORMANCE OBJECTIVE

The student will etch a design of his own on a sheet of copper metal and be able to observe the corrosive effect of an acid on a metal.

05

ACTIVITY Etch Your Sketch

I. SITUATION

Etching is the process of eating away metal by a chemical action using an acid. The object to be etched is first coated with an acid resistant coat called the resist. This resist could be: 1. beeswax 2. asphaltum varnish 3. black enamel paint, or 4. masking tape. Then the acid is allowed to attack the metal by exposing parts of the metal through the resist.

II. STEPS

1. Prepare the acid in a 250 ml beaker by adding very slowly 20 ml of nitric acid to 20 ml of water, while stirring.

2. Obtain a sheet of copper and clean thoroughly by either using an acid bath or by polishing with steel wool. Avoid touching afterwards.

3. Spray or brush black enamel paint on to both surfaces of the copper and allow to dry.

4. Lay out a design on paper and then transfer to the metal by tracing using a sharp pencil.

5. With a sharp metal object such as a knife or nail, scratch the paint from the copper surface using the pencil marks as a guide.

6. Pour the acid preparation into a shallow dish and place the painted and scribed copper sheet into the bath. Wait one hour before removing.

7. Remove the copper from the bath and rinse with water. (CONTINUED)

RECOMMENDATIONS

MATERIALS

250 ml beaker	shallow glass container	graduated cylinder
20 ml nitric acid	thin copper sheet	steel wool
black enamel paint	knife	pencil
thinner	detergent	

MATERIALS

GRADE 8 - B[2]

SUBJECT Science

CLUSTER Industrial Arts

JOB TITLE Metal Worker

CONCEPT

PERFORMANCE OBJECTIVE

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ACTIVITY

28

I. SITUATION

II. STEPS

8. Remove the enamel with a cloth soaked in turpentine or thinner.
9. Wash in hot soapy water and polish the raised surface with steel wool.

RECOMMENDATIONS

MATERIALS

GRADE 8-B 3

SUBJECT Science

CLUSTER Industrial Arts

JOB TITLE Metalworker

CONCEPT

Color as a temperature indicator

PERFORMANCE OBJECTIVE

The students will be able to heat a piece of steel, observe the color changes, freeze the steel at a color; and by comparison with a chart indicate the temperature obtained.

27
22

ACTIVITY

I. SITUATION

The color emitted as an object is heated is an indicator of the degree of temperature. This process is critical when hardening or tempering steel. The colors for common tools are as follows:

Hammer face--	Pale yellow--	430-450°F
Center punch--	Full yellow--	470°F
Cold chisel--	Brown--	490-510°F
Screwdriver--	Purple--	530°F

II. STEPS

1) Grip a piece of drill rod or round cold-rolled steel with cushion-grip pliers.

2) Heat the steel using a propane torch.

3) After heating a few minutes or at least to the yellow color stage, dip the steel into oil or water. This will freeze the color at this temperature.

4) Have the student compare the color he/she obtains with the range possible in order to determine the temperature of his/her piece of steel. The range of colors is as follows:

Color	Degrees F	Color	Degrees F
White	2,200	Pale blue	590
Lemon	1,825	Purple	530
Orange	1,725	Brown	490-510
Bright red	1,375	Full yellow	470
Dark red	1,175	Pale yellow	430-450
Faint red	900		

RECOMMENDATIONS

MATERIALS

Drill rod or round cold-rolled steel, propane torch, cushion-grip pliers

MATERIALS

GRADE 8-B 4

SUBJECT Science

CLUSTER Industrial Arts

JOB TITLE Sheetmetal Worker

CONCEPT

Adhesion and capillary action

PERFORMANCE OBJECTIVE

The student will form a seam using two pieces of a tin can and soldier the seam. He/she will be able to indicate the difference between adhesion and capillary action.

ACTIVITY

I. SITUATION--Smokeless Joints

Soldiering two pieces of tin can together can illustrate to the student the bonding of unlike molecules, called adhesion. Also, the drawing action of the soldier through the joint will illustrate capillary action.

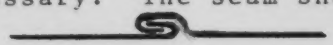
II. STEPS

1) Using tinsnips, cut the ends off a tin can.

2) Then divide the can into two parts by cutting two opposite cuts parallel to the seam.

3) Press the two sections flat and, using a pair of pliers, roll one edge on each of the two sections.

4) Put the two sections together to form a seam and hammer slightly for alignment, if necessary. The seam should look like this:



5) Heat the seam with a soldiering gun or iron and apply soldier to the end of the seam. The soldier should be drawn into the joint by capillary action and through it to the other end.

6) Have the student attempt to pull the two parts apart when they have cooled.

RECOMMENDATIONS

MATERIALS

Tin can, tinsnips, hammer, pliers, soldiering gun or iron and soldier

MATERIALS

GRADE 8-B 5

SUBJECT Science

CLUSTER Industrial Arts

JOB TITLE Carpenter

CONCEPT

Mechanical advantage of simple machines

PERFORMANCE OBJECTIVE

The students will be able to write a statement explaining the use of simple machines and their advantages.

54

ACTIVITY

I. SITUATION--The Simply Necessary Simple Machines

Simple machines give us mechanical advantage in doing work. Using ordinary carpenter tools, this principle can easily by demonstrated; and the student can choose whether or not he needs a simple machine.

II. STEPS

1) Cut the tip off (chiseled end) of one of four nails, using tinsnips or a hacksaw.

2) Using a hammer, drive one of the uncut nails into a block of wood.

3) Repeat, using the cut-off nail, and observe the difference.

4) Drive the third nail into the wood using just the hammer head minus the handle.

5) Drive the fourth nail into the wood leaving about an inch sticking out.

6) Try removing this last nail using just the fingers. Then remove it using the claw of the hammer head.

7) Drill two holes in the wood that are just slightly smaller than the threads of a screw.

8) Try screwing a screw into one of the holes using the fingers.

9) Drive the second screw into the other hole using a screwdriver.

10) Have the student write a brief report on his findings and relate them to simple machines.

RECOMMENDATIONS

MATERIALS

Small block of wood (1"x4"x4"), claw hammer, claw hammer head only, 4 10-penny flathead nails, screwdriver, 2 1" wood screws

MATERIALS

GRADE 8-B 6

SUBJECT Science

CLUSTER Industrial Arts

JOB TITLE Foundry Worker or Metal Worker

CONCEPT

Annealing: the process of making metal more flexible.

PERFORMANCE OBJECTIVE

The student will be able to anneal a steel needle and, by comparing the angle at which it breaks with that of an unheated needle, be able to note the flexibility difference.

ACTIVITY

I. SITUATION

Metal such as steel can be made softer and more flexible by controlled heating and slow cooling. This process is called annealing. Heating allows some of the carbon in the steel to combine with the iron forming iron carbide which, when cooled slowly, breaks down slightly into iron and graphite. This makes the iron softer, malleable and flexible.

II. STEPS

1) First test the flexibility of a steel needle. Hold one end with pliers and press the other against a glass saucer or small dish.

2) Have another person hold a piece of plastic wrap over this pressing process in order to stop flying needle tips.

3) Observe the flexing carefully. Record with a sketch the angle at which the needle breaks.

4) Heat another steel needle, using an alcohol burner, until the needle is red hot. Be sure to hold the needle during heating with a pair of pliers.

5) Allow the needle to cool very slowly.

6) Test the amount of bending the heated needle will take before it breaks.

7) Record and sketch the angle at which the heated needle breaks.

8) Compare the needle flexibility of the heated and unheated needles.

RECOMMENDATIONS

MATERIALS

2 steel needles, glass saucer, pliers, plastic wrap, alcohol burner

MATERIALS

GRADE 8-C'

SUBJECT Science

CLUSTER Arts and Humanities

JOB TITLE Jewelry-Maker

CONCEPT

Volume

PERFORMANCE OBJECTIVE

Students will be able to explain and/or demonstrate the concept that change in shape of material does not affect its volume.

95

ACTIVITY

I. SITUATION--Holy Shrunken Liver Lids

Plastic liver lids, which can be obtained cheaply from grocery stores, are ideal for making colored pendants,as well as useful in showing the student that drastic changes in the shape of material does not affect its volume.

II. STEPS

1) Cut off the outside lip of the lid leaving a fairly circular shape.

2) With a hole punch, punch a hole toward the outside edge.

3) Measure the diameter and the thickness. In order to measure the thickness, measure the thickness of many lids together and divide by the number measured.

4) Calculate the volume (disregarding the hole) by using the formula $V = r^2t$ where t is thickness.

5) Using colored marking pens, place a design on the lid; which can be either traced, since the lid is transparent, or original.

6) Place the lid on a cookie sheet or pan and put it into an oven set at $400^{\circ}F$ for at least two minutes.

7) Remove, measure the diameter and thickness and again calculate the volume. The two volumes should be approximately the same since only the shape has been changed.

RECOMMENDATIONS

MATERIALS

Liver lids, scissors, hole punch, string, colored marking pens, cookie sheet or pie pan, ruler, oven

MATERIALS

GRADE 8-C 2

SUBJECT Science

CLUSTER Arts and Humanities

JOB TITLE Potter

CONCEPT

Exactness in metric measurement

PERFORMANCE OBJECTIVE

The student will mix, using a metric balance, a glaze recipe and color formula, paint it onto the surface of a clay tile and fire it in a kiln for use as a test tile. The test tile can be matched with a standard for correctness.

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ACTIVITY Page 1 of 5

I. SITUATION--Toiling Over Test Tiles

Given a number of glaze recipes and formulas of color, the student can make test tiles, paint them with the different colored glazes, have them fired;and then they can be utilized for comparison purposes. This activity also teaches that exactness in measurement and mixing is a necessary requirement for success.

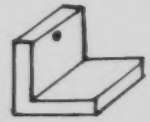
II. STEPS

1) With a balance weigh out to tenths of a gram the materials to make the glazes. Have each student or group of students try different recipes in order to gain the maximum number of combinations.

2) The colors are found by multiplying the percent by the total weight of the recipe.

3) Mix very thoroughly in a beaker or mortar the ingredients of the glaze recipe and the color formula.

4) Make a test tile with clay as illustrated: The hole allows for hanging and the shape tests the glazes horizontally as well as vertically.



5) Paint the glaze on the vertical and horizontal faces of the test tile and fire in a kiln.

6) Remove the tile, hang and check with the instructor for correctness of mixing the glaze recipe and colors. This can be done either by comparing against a standard or by utilizing the instructor's judgement.

(glaze recipes on following pages)

RECOMMENDATIONS

MATERIALS

The materials will have to be obtained from the arts and crafts teacher and arrangements made as to the purchase of these materials.

MATERIALS

GRADE 8-C[2]

SUBJECT Science

CLUSTER Arts and Humanities

JOB TITLE Potter

GLAZE RECIPES:

INGREDIENTS	GRAMS
Colemanite Glaze C/8-10	
Oxford Feldspar	24.7
Flint (Silica)	21.0
Kaolin (China Clay)	3.4
Magnesium Carbonate	2.5
Barium Carbonate	6.9
Colemanite	5.4
Whiting	9.3
Colors:	
Blue-Green Spotted:	3% Rutile ½% Cobalt Carbonate 1% *Chrome Oxide Green* 2% Granular Manganese
Warm Textured Blue:	½% Cobalt Carbonate 3% Rutile
Gray-Blue:	½% Cobalt Carbonate 1% Nielsle Oxide Black
Albany Slip Glaze C/9-10	
Albany Slip	60.0
Cornwall Stone	25.0
Iron Oxide	5.0
Whiting	10.0
Do not add colors.	

GRADE 8-C 2

SUBJECT Science

CLUSTER Arts and Humanities

JOB TITLE Potter

GLAZE RECIPES:

INGREDIENTS	GRAMS
Colemanite Glossy Glaze C/5	
Fret 3134 (Ferro Corp)	15.2
Kingman Feldspar	20.9
Whiting	3.3
Gerstley Borate	3.0
Tennessee Ball Clay	2.2
Flint	1.5
Colors:	
Turquoise	
Copper Carbonate	18
Gray-Blue	
Iron Chromate	18
Blue-Green Textured	
Copper Carbonate	18
Cobalt Oxide	3
Rutile 2%	

Metallic Black Glossy C-5

This glaze is good by itself or over other glazes to give mottling and specks.

Kaolin (China Clay)	9.5
Kingman Feldspar	152.6
Whiting	10.6
Gerstley Borate	20.8
Copper Carbonate	8.0
Manganese Dioxide	8.0
Cobalt Oxide	4.0

GRADE 8-C

SUBJECT Science

CLUSTER Arts and Humanities

JOB TITLE Potter

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ACTIVITY

GLAZE RECIPES AND FORMULA COLORS:

INGREDIENTS	GRAMS
White Glaze - Tibesian Cone (04-5)	
Flint	35.1
Colemanite	29.2
Kingman Feldspar	27.0
Flint 25	7.5
Nepheline Szenite	12.5
Zinc Oxide	9.0
Talc	4.5
Tin Oxide	5.0

The following formula colors can be used with most glazes.

COLOR	%	MATERIAL
Medium Blue	½	Cobalt Carbonate
Light Blue	¼	Cobalt Carbonate
Turquoise	½	Cobalt Carbonate
	1	Chrome Oxide Green
Warm Textured Blue	½	Cobalt Carbonate
	3	Rutile
Gray-Blue	½	Cobalt Carbonate
	1	Nickel Oxide
Gray or Gray-Brown	1	Nickel Oxide
Brown	4	Magnesium Carbonate
Textured Brown	4	Magnesium Carbonate
	4	Rutile
Spotty Brown	3	Almenite
Textured Yellow-Brown	2	Almenite
	2	Rutile

GRADE 8-C 2

SUBJECT Science

CLUSTER Arts and Humanities

JOB TITLE Potter

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ACTIVITY Page 5 of 5

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GLAZE FORMULA COLORS:

COLOR	%	MATERIALS
Celadon	1	Iron
Dark Olive Celadon	2	Iron
Mottled Green or Brown	4	Iron
Saturated Iron Red	10	Iron
Copper Red	½	Copper
Deep Copper Red	1	Copper
Red to Black	3	Copper
Black	1	Cobalt
	8	Iron
	3	Manganese

GRADE 8-C

SUBJECT Science

CLUSTER Arts and Humanities

JOB TITLE Interior Decorator

CONCEPT

Absorption and transmission of light

PERFORMANCE OBJECTIVE

By looking at colored objects under different colored lights, the student can gain information concerning the absorption, transmission and additive property of light. The students results can be verified by the instructor.

ACTIVITY

I. SITUATION

Colored objects and how they appear under different colored lights are very important to an interior decorator. Curtains, drapes, wall paint and furniture may change color completely when viewed under natural versus artificial light. This activity gives the student a chance to experiment and gain experience on the subject.

II. STEPS

1) Set up three slide projectors to show their beams on a screen or a white wall.

2) Tape a green plastic filter over one projector, a red over another and a blue over the third.

3) Overlap the beams of the three colored lights and observe the resultant color.

4) Tape different colored construction paper onto the screen or wall and, using the repective light, shine it on the object and report on the apparent color.

5) A suggested arrangement is as follows:

Color of Object	Color of Light	Apparent Color	Color of Object	Color of Light	Apparent Color
Red	White		Blue	Green	
Green	White		Red	Red	
Blue	White		Green	Red	
Red	Green		Blue	Red	
Green	Green				

RECOMMENDATIONS

MATERIALS

Three slide projectors; red, green and blue construction paper; tape; one color filter set #203 from the Frey Scientific Co., 4655 Diamond St., Mansfield, Ohio 44903

MATERIALS

GRADE 8-D

SUBJECT Science

CLUSTER Business and Office

JOB TITLE Data Processing Machine Operator

CONCEPT

Interpretation of a model

PERFORMANCE OBJECTIVE

Given a sample data processing card with coded information punched into it, the student will use the information to code punch his/her own name into another card which can be verified as to accuracy by the teacher.

ACTIVITY

I. SITUATION--Breaking the Code

IBM data processing cards have data or information coded in the form of holes on them. This information is the type which can be read and processed by a machine. People working in this field must also be able to interpret the coded information. In this activity, the student is given an opportunity to decipher this machine language.

II. STEPS

1) Obtain the data processing cards from any local business or from IBM.

2) Have a card keypunched with the alphabet and the digits. They should also be printed at the top of the card when keypunched, if possible.

3) If keypunching is not available, then mark the holes on the card and letter them.

4) Give the sample punched card to the student. Have the student study the card carefully and try to figure out the code on his/her own.

5) Give the student a blank card and have him/her punch and print his/her name by marking out the respective holes with a pen or pencil.

6) Have the teacher check the accuracy of the name card produced by the student.

RECOMMENDATIONS

MATERIALS

IBM data processing cards and marking pens

MATERIALS

GRADE 8-E

SUBJECT Science

CLUSTER Communications & Media

JOB TITLE Electronic Technician

CONCEPT

Electromagnetic induction

PERFORMANCE OBJECTIVE

The students will be able to explain the effect of electromagnetic induction and describe the principle of operation of a microphone, either orally or in writing.

ACTIVITY

I. SITUATION

A microphone is a mechanical device that takes sound energy and converts it to electrical energy. A speaker works just the reverse and the principle involved for both is electromagnetic induction.

II. STEPS

1) Wrap a compass with many turns of fine copper wire. Example:

2) Position the compass on a nonmetal table so that the needle is parallel with the wire.

3) Make another coil by wrapping the wire around a piece of wood, such as a broom handle. Then remove the wood.

4) Scrape the ends of the wires free of insulation, if there is any, and connect the ends of the two coils. They should be five to ten feet apart.

5) Stand a bar magnet upright on another table five feet away, using clay to hold it upright in place.

6) Slide the coil rapidly up and down the magnet and observe the needle. (The needle is deflected: electromagnetic induction occurs and current is produced in the wire.)

7) A milliameter can be used to confirm the presence of a current produced in the wire.

RECOMMENDATIONS

MATERIALS

Compass, fine copper wire, bar magnet, clay, milliameter

MATERIALS

GRADE 8 - G

SUBJECT Science

CLUSTER Environmental & Control

JOB TITLE Filtration Engineer

CONCEPT

Removal of suspended particles in solution by filtration

PERFORMANCE OBJECTIVE

The student will remove suspended mud particles from a solution and compare this solution with a muddy sample.

ACTIVITY Silly Silica Silt Suspensions

I. SITUATION

In order to obtain pure drinking water, the undissolved impurities or masses of accumulated sediment must be removed by filtration. One means that communities use to filter is by passing water through layers of sand, gravel and charcoal inside of large filter tanks. This activity demonstrates this filtering technique.

II. STEPS

1. Moisten a 6" length of glass tubing and insert into a two inch rubber stopper.
2. Fit stopper into one end of a 2" diameter open end glass cylinder or chimney.
3. Support the cylinder, open end up, with a stand and clamp.
4. Dividing the cylinder into thirds, add a layer of coarse gravel, a layer of fine gravel and a layer of sand to the cylinder.
5. Very slowly pour muddy water into the tower.
6. Collect the filtered water in a beaker at the bottom.
7. Have the student compare the filtered water with the muddy sample, to see which sample he would rather drink.

RECOMMENDATIONS

MATEIRALS 2" diameter glass chimney or open end cylinder
6" length of glass tubing coarse gravel
fine gravel sand clamp
ring stand beaker

MATERIALS

GRADE 8-H

SUBJECT Science

CLUSTER Personal Service

JOB TITLE Cosmetician

CONCEPT

The chemical effect of a bleaching agent on protein

PERFORMANCE OBJECTIVE

The student will be able to bleach samples of different colors of hair and indicate which color or colors are hardest to bleach.

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ACTIVITY

I. SITUATION--Blonds Have More. . .

In order to change the color of hair, it is necessary first to bleach out the original color. This bleaching process has various stages, as indicated by color changes, and is important for obtaining the final desired color. In this activity various colors of hair are subjected to bleaching, and each resulting color indicates whether more bleaching is necessary.

II. STEPS

1) Obtain samples (this will be the hardest part) of different colors of hair. The ideal situation would be a sample of blond, of light brown, of dark brown and of black.

2) Split each sample into two parts and tie with a thread or string in order to hold the strands together.

3) Place one of each sample in a separate petrie dish and label each dish.

4) Add 20 to 30 ml of hydrogen peroxide to each dish. Place the second half of each sample in front of its respective dish to be used as a comparison.

5) Allow the samples to stand at least 30 minutes or longer, if possible.

6) Remove each sample, rinse in water and compare with the unbleached sample.

7) Ask the student which hair color was easiest to bleach and have him/her indicate which one(s) might take longer or need rebleaching.

RECOMMENDATIONS

MATERIALS

Thread or string, 4 petrie dishes, hydrogen peroxide

MATERIALS

GRADE 8 - I

SUBJECT Science

CLUSTER Manufacturing

JOB TITLE Auto Manufacturing Worker

ACTIVITY Cast Away

I. SITUATION

The process of heating a metal to a liquid, pouring the liquid into a mold, and then the cooling and hardening into the shape of the mold is called casting. Many parts made in industry, such as engine blocks, are made through this casting process which eliminates expensive tooling in order to obtain desired shapes.

II. STEPS

1. Slice a potato in half and then cut a form, such as your initial(s) into the flat cut side of the potato. (Be careful not to cut the potato all of the way through.)
2. Set up a ring stand, ring holder, wire gauze & place an evaporating dish on the gauze.
3. Place an inch of bar solder, or melt an equivalent amount of wire solder, into the evaporating dish and melt with a propane torch.
4. When the solder is fully melted, use tongs or pliers to lift the evaporating dish and pour the molten solder into the potato mold.
5. Allow the cast to cool and then remove the casting.

CONCEPT

Changes in the state of matter.

PERFORMANCE OBJECTIVE

The student will make a casting, observing the change in state from solid to liquid and back to solid again. He can also see the ease in which a solid can be made to change to a desirable shape.

RECOMMENDATIONS

The teacher may want to be the one to transfer the molten metal.

MATERIALS ring stand, ring holder, wire gauze, propane torch, pliers or tongs, evaporating dish, solder, potato

MATERIALS

GRADE 8-I

SUBJECT Science

CLUSTER Transportation

JOB TITLE Mechanic

CONCEPT

Pressure exerted from the expansion of gases or liquids

PERFORMANCE OBJECTIVE

The student will construct a model of an oil pressure gauge and observe and explain the effect of pressure that a gas or liquid exerts when it expands.

ACTIVITY

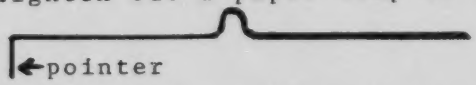
I. SITUATION--Blow the J Tube Down

Oil must be forced to most parts of the engine in order to reduce friction and wear. This is a crucial part of the transportation process. In order to measure the oil pressure and determine its adequacy, we use gauges based upon the principle that liquids exert a pressure when expansion occurs.

II. STEPS

1) Make a J-shaped tube out of a soda straw by bending one end and folding it over.

2) Straighten out a paper clip to this form:



3) Bend up the ends of a two-inch strip of fairly heavy cardboard and cut V-shaped notches in the top of the bends.

4) Lay the paper clip across the notches and mark a scale on the cardboard. The pointer of the paper clip should be free to turn.

5) Tape the straw to the inside of the U-shaped cardboard frame. Align the straw with the U of the paper clip.

6) Attach a string from the closed end of the J tube and the U of the paper clip. There should be no slack in the string.

7) Blow on the open end of the straw and notice the reading on the scale as the tube tends to straighten out.

RECOMMENDATIONS

MATERIALS

Stiff cardboard, paper clip, string, soda straw, tape, marking pen

MATERIALS

GRADE 8 - K'

SUBJECT Science

CLUSTER Health Occupations

JOB TITLE

CONCEPT

Antiseptics

PERFORMANCE OBJECTIVE

The student will prepare beans with different antiseptics and after a time interval, be able to indicate which of the antiseptics were the most effective.

69

ACTIVITY Beans = Good Gas?

I. SITUATION

Sterilization of gloves, clothes and instruments used in operating rooms is a necessary requirement in order to kill germs. Even the cleaning help has to be trained in the use of antiseptics in a modern hospital facility. This activity allows the student a chance to test the effect of some antiseptics.

II. STEPS

1. Soak a handful of lima beans in cold water for several hours.
2. Label three small mouth bottles, I, A, and H. Leave the fourth unlabeled.
3. Place several beans into each bottle and add enough water to cover them.
4. Add 10 ml of tincture of iodine to the I labeled bottle, 10 ml of alcohol to the A labeled bottle and 10 ml of hydrogen peroxide to the third or H labeled bottle.
5. Stopper the bottle with sterile absorbent cotton.
6. After a week, remove the cotton and smell the contents of each bottle. A foul odor indicates that germs are active.
7. Have the student indicate which antiseptic worked best.

RECOMMENDATIONS

MATERIALS 1 cup lima beans 4 small mouth bottles small graduated cylinder tincture of iodine alcohol hydrogen peroxide marking pen tape absorbent cotton

MATERIALS

GRADE 8-K 2

SUBJECT Science

CLUSTER Health Occupations

JOB TITLE Physician

CONCEPT

Resonance of sound

PERFORMANCE OBJECTIVE

Students will be able to explain and/or demonstrate the use of resonance by doctors to determine infected chests.

02

ACTIVITY

I. SITUATION--Who's That Thumping on My Chest?

When lungs are free of infection, they give a hollow sound if the chest cavity is thumped. If infected, they become partly filled with mucus and give a dull, solid sound. The principle of resonance (an object vibrating at its natural frequency) is utilized.

II. STEPS

1) Obtain a cardboard box, such as a small cereal box. Fill the bottom one-third with sand or salt.

2) Fill the middle third of the box with crumpled paper.

3) Leave the upper third empty and tape the top of the box closed.

4) Listen to the sound the box gives off when someone thumps the upper, middle and lower part of the box with the fingers.

5) Have the student indicate either verbally or in writing how the doctor uses resonance to test for healthy lungs.

6) As an optional feature, and if a stethoscope is available, have the students practice listening on each other.

RECOMMENDATIONS

MATERIALS

Small cardboard box, salt or sand

MATERIALS

GRADE 8-K 3

SUBJECT Science

CLUSTER Health Occupations

JOB TITLE Physician

CONCEPT

Air pressure

PERFORMANCE OBJECTIVE

The students, after setting up the apparatus shown in the activity, will be able to explain the effect of air pressure and how it relates to the operation of our lungs either orally or in writing.

ACTIVITY

I. SITUATION--Rubber Lungs

This activity demonstrates to the student how our diaphragm is used to change the air pressure within our chest cavity and how this act, in turn, inflates and deflates our lungs.

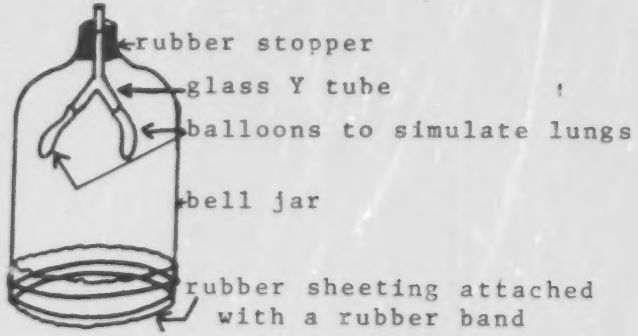
II. STEPS

1) Set up the apparatus as shown in the diagram.

2) Pull down on the rubber sheeting, which creates a partial vacuum, which in turn inflates the balloons due to the outside air pressure.

3) Push up on the rubber sheeting. This increases the pressure inside the jar and deflates the balloons.

4) Have the students feel the abdomen and ribs while breathing in order to relate the observations to the body.



RECOMMENDATIONS

MATERIALS

Bell jar, rubber stopper, glass Y tube, rubber sheeting, rubber band, two balloons

MATERIALS

GRADE 8-L

SUBJECT Science

CLUSTER Public Service

JOB TITLE Meter Reader

CONCEPT

PERFORMANCE OBJECTIVE

Students will be able to figure the cost of electricity by calculating kilowatt hours where figures are given.

ACTIVITY Page 1 of 2

I. SITUATION--Kill Your What's?

The students can become familiar, by building a model, of the metering device on their homes and gain experience in reading the meter. Also, they can do simple calculations concerning the cost of electricity used over a time period.

II. STEPS

1) On white construction paper mark off a circle, with a compass, six inches in diameter and cut it out.

2) Also, on the same construction paper, mark off four circles, each an inch in diameter.

3) With a marking pen, number two of the small circles as in figure 1.

4) With a marking pen, mark off the other two small circles as in figure 2.

5) Paste the four circles on the large circle in the order of figure 3.

FIGURE 1

FIGURE 2

FIGURE 3

RECOMMENDATIONS

It would enhance the activity if a meter reader could talk to the class or a real meter could be demonstrated.

MATERIALS

Sheet of construction paper, 4 paper fasteners, marking pen, scissors, glue

GRADE 8-L

SUBJECT Science

CLUSTER Public Service

JOB TITLE Meter Reader

ACTIVITY

II. STEPS

6) Glue pointers made of paper on each of four paper fasteners and push each fastener through the center of each small circle and fasten.

7) Label the large circle "kilowatt hours" under the small circles.

8) Have students practice reading the settings the teacher makes on the meters.

9) Have the students do a calculation of the cost of electricity used over a period. Take the difference in two readings and multiply by a cost factor of six cents per kilowatt hour.

GRADE 8 - M

SUBJECT Science

CLUSTER Agriculture & Nat. Resources

JOB TITLE Mining Engineer

ACTIVITY The Gangue's All There

I. SITUATION

Minerals often occur in the natural state at the earth's surface, mixed with other materials forming an ore. These other materials must be removed in order to extract the mineral. This activity is a little messy but it shows a simple separation process.

CONCEPT

Replacement Reaction

PERFORMANCE OBJECTIVE

The student will mix lead oxide and sand to form an ore sample, then add a third ingredient and observe how the wanted product, lead, was separated by a replacement reaction.

II. STEPS

1. In a 250 ml beaker mix 10 grams of fine sand with 10 grams of lead oxide. This will produce the "ore" sample.
2. Place this ore into a large test tube along with 10 ml of mineral oil and shake vigorously with a solid rubber stopper.
3. Filter the solid from the liquid and have the student observe the separation of the lead mineral.

RECOMMENDATIONS

MATERIALS fine sand, lead oxide, balance, 250 ml beaker, large test tube, mineral oil, rubber stopper

MATERIALS

GRADE 8 - M²

SUBJECT Science

CLUSTER Agriculture & Nat. Resources

JOB TITLE Farmer

CONCEPT

Plant Growth

PERFORMANCE OBJECTIVE

The student will grow plants using different degree temperatures of water and, through observation, will determine the effect of heated water on plant growth.

ACTIVITY Hot, Hot Plants

I. SITUATION

In many of the western states and parts of the world, geothermal water is being used to irrigate crops. This activity allows the student a chance to investigate the effects (if any) on the growth of a plant using heated water.

II. STEPS

1. Obtain three peatmoss pellets and with a sharp object open a hole in the top of the pellets and plant three tomato seeds in each hole.
2. Place each pellet in a saucer and label the saucer.
3. Water the first plant with cold water, the second with 50°C water and the third with 70°C water.
4. Continue the watering on a periodic basis in order to keep the pellet moist.
5. Place the plants in a warm sunny position, where they won't be disturbed.
6. Record the heights of the plants to the nearest milimeter when they appear.
7. Continue the recordings and chart the growth for three to four weeks to determine the effect of hot water used to water plants.

RECOMMENDATIONS

MATERISL three peatmoss pellets, tomato seeds, 3 saucers, thermometer, metric ruler

MATERIALS

GRADE 8 - N

SUBJECT Science

CLUSTER Marine Science

JOB TITLE Oceanographer

CONCEPT

Accurate measurement of distances

PERFORMANCE OBJECTIVE

The student will, without being able to see the bottom, plot the bottom surface in a can of water. The accuracy can be determined by comparing with a known plot.

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ACTIVITY Ghosts of Mark Twain, or, Can You See the Bottom?

I. SITUATION

A profile picture of the bottom can be obtained in deep water by using sound reflection and in shallow water direct soundings can be obtained with weighted rope. This activity allows the student the chance to map the bottom of a container filled with water even though the bottom can't be seen.

II. STEPS

1. Mix plaster of Paris in about 500 ml water until a medium thickness is obtained.
2. Tilt a metal coffee can by placing a book under one edge of the bottom. Pour the plaster mixture into the can so that the bottom is covered, and allow to harden .
3. Tilt the can the other direction and pour more plaster into it in order to obtain a V-shaped bottom.
4. Variations of the V can be obtained if more than one can is used. These cans can be numbered for identification.
5. Pour water into the can to a depth of 4-6".
6. Add nonfat powdered milk and stir to make the water opaque and hide the bottom from view.
7. When the student obtains the can, have him place the seam toward himself for direction reference. Then place a piece of graph paper over the top of the can;center it and draw the outline of the can top. (CONTINUED)

RECOMMENDATIONS

MATERIALS 1 metal coffee can, small lead weight, string, metric ruler, wire screen (½" mesh 6" x 6"), graph paper, marking pen, plaster of Paris

MATERIALS

GRADE 8 - N

SUBJECT Science

CLUSTER Marine Science

JOB TITLE Oceanographer

ACTIVITY

I. SITUATION

CONCEPT

PERFORMANCE OBJECTIVE

II. STEPS

8. Remove the graph paper; label the seam side South and then label the other compass directions.
9. Center the wire screen over the can top.
10. Attach a 50 cm long string to the lead fishing weight. This weight has to be small enough to fit through the screen.
11. Lower the weight and mark on the string when the weight touches water. This gives a zero reference mark of the height that the screen is above water.
12. Starting with the square on the screen that is farthest north, lower the weight until it touches bottom, pinch the string with the fingers at the wire level, pull weight up and measure the distance from the weight to the fingers gripping the string to the nearest millimeter. Subtract the distance from the weight to the zero mark and you have the depth of the water.
13. Repeat the probing using all of the squares and record these depths on the graph.
14. Draw a profile, from east to west and north to south, of the bottom.

RECOMMENDATIONS

MATERIALS

GRADE 8 - 0

SUBJECT Science

CLUSTER Marketing & Distribution

JOB TITLE Quality Controller

CONCEPT

Specific Gravity

PERFORMANCE OBJECTIVE

Students will be able to build a simple hydrometer, measure the specific gravity of various liquids and compare these readings obtained with standard readings as a gauge of accuracy.

RECOMMENDATIONS

ACTIVITY Are You on the Level?

I. SITUATION

A good many petroleum products are distributed around the country through a pipeline. From the refinery, products obtained from fractional distillation could include not only gasoline, but kerosene, fuel oil, lubricating oil and natural gas. These materials are forced through the same pipeline. In order to determine what, and what is the quality in the pipeline, at a given time, a specific gravity check must be made.

II. STEPS

1. Flatten three inches on one end of a drinking straw, fold it over several times and glue it down flat.
2. After the glue dries, place the straw in a 600 ml beaker almost full of water and slide bb's down the open end until the straw floats upright.
3. With a marking pen, place a mark at the water level and label the mark with a number '1'.
4. In a 250 ml beaker, place 200 ml of water and enough salt until the water is saturated.
5. Place 200 ml of alcohol in another 250ml beaker.
6. Place the straw hydrometer into each of the beakers and mark the level of flotation. The salt solution should be 1.15 and the alcohol
7. Ask the students to compare his readings with the standard figures. A real hydrometer could be used as a guide.
8. Other liquids could be tested, such as: milk: 1.02; SAE 20 oil 0.87; kerosene: 0.82

MATERIALS

MATERIALS: one 600 ml beaker; two 250 ml beakers; drinking straw; glue; bb's; marking pen; salt & alcohol

Hydrometer and other liquids are optional.

GRADE 8 - P

SUBJECT Science

CLUSTER Construction

JOB TITLE Builder

ACTIVITY Test for Toughies

I. SITUATION

While concrete is an ideal material for building, there may be other types of material that are cheaper and hold up better under compression. This activity compares the compression capability of concrete and a fairly new type of material commonly called rigid foam.

CONCEPT

Compressibility of Material

PERFORMANCE OBJECTIVE

The student will form two blocks; one out of concrete and the other out of a polyether base urethane resin in order to determine by striking how they compare in compressive strength.

II. STEPS

1. Mix sand, water and concrete in a paper cup. Use the proportions recommended on the instructions.
2. After the concrete has hardened, which should at least be overnight, remove the cup.
3. Warm the polymer to 90°F by placing the capped bottle under warm, then hot water for a few minutes. Do not warm the activator.
4. Pour 10 cc of the polymer and 10 cc fof the activator into a waxed paper cup.
5. Stir the liquids until they are well mixed and the color changes from amber to white. Cease stirring and allow to foam.
6. After foaming stops, allow to cool for 20 min. and remove the paper cup.
7. Up end both samples so that the small ends are up, and place them on a piece of newspaper.

(CONTINUED)

RECOMMENDATIONS

MATERIALS

MATERIALS sand, concrete, 2 paper cups, thermometer, graduated cylinder, stirring stick, newspaper, 2 pcs cloth, hammer

Rigid Foam Kit from Frey Scientific, 4655 Diamond St., Mansfield, Ohio 44903 @$3.95

GRADE 8 - P

SUBJECT Science

CLUSTER Construction

JOB TITLE Builder

CONCEPT

PERFORMANCE OBJECTIVE

ACTIVITY

I. SITUATION

II. STEPS

8. Cover both with a cloth to keep bits from flying.
9. Strike each block with a hammer to see which one stands up best under a compreession load.

RECOMMENDATIONS

MATERIALS

GRADE 9-A'

SUBJECT Science

CLUSTER Home Economics
Consumer Education

JOB TITLE Home Economist

CONCEPT

Different colors of light represent different amounts of energy.

PERFORMANCE OBJECTIVE

The student will be able to give an oral report on step #5 to prove his/her understanding of the concept.

ACTIVITY

I. SITUATION--Choose Your Color and Keep Your Cool

Solve the energy crisis by proper selection of clothing. Simply select to keep a summertime cool and a wintertime warmth.

II. STEPS

1) Look up in a physical science text the wave theory of light. Discuss wave length and color of light.

2) Cover four juice cans with one layer of the same kind of fabric, one black, one white and two other solid colors. Cut a cardboard larger than the top of each can and mount a thermometer in each can so the thermometer will not touch the sides or bottom.

3) Mount a light socket to hold a 150 to 300 watt bulb s tting base down. Set the cans in a circle around the light bulb measuring each for equal distance. Turn on the power and record the temperature increase of each can for equal time intervals.

4) Invent a table or chart on which to record your temperatures. This will assist you in interpretations of results.

5) Use the ideas from the wave theory of light to make a written interpretation of your results.

RECOMMENDATIONS

MATERIALS

Four 46 fluid ounce juice cans, light socket, 150 to 300 watt light bulb, source of power, card board, four thermometers

MATERIALS

GRADE 9-A 2

SUBJECT Science

CLUSTER Home Economics
Consumer Education

JOB TITLE Dietitian

CONCEPT

The calorie is a measure of the kinetic energy (moving molecules) of a substance. Energy depends on the number of molecules (grams) and the speed of the molecules (temperature).

PERFORMANCE OBJECTIVE

The students will be able to:

1) actually perform steps #2, #3, and #4;

2) distinguish between energy (heat) and heat energy (temperature).

3) define a calorie.

RECOMMENDATIONS

ACTIVITY

I. SITUATION--Introduction to Calories

A group of students are to start a unit of work on planning diets and involving calories. Calories, to them, are only a number. They need to know more about the calorie.

II. STEPS

1) From a science text or other source, look up the usage of the following:
   a) Energy and its kinds
   b) Energy and its forms
   c) Heat and its measurements
   d) Temperature and its measurements
   e) Define a calorie. How much heat is a calorie?
   f) Define a B.T.U. How much heat is a B.T.U.?

2) Weigh a 250ml beaker. Fill it about half full of water and weigh it again. Calculate the weight of the water.

3) Take the temperature of the water in degrees centigrade. Heat, but do not boil it and take the temperature again. Find the temperature change.

4) Go back to step #1f and calculate how many calories of heat were added to the water in the energy exchange.
   a) (grams of water) (calories per gram) (temperature change) = calories added

5) Look up the term kilocalorie (same as food calorie). How many food calories were added to the water in step #3 above?

6) Fill a 1,000ml graduate with water. Imagine you had 2,400 of them sitting side by side and you heated all this water 1°C; this is the equivalent of the heat derived from a daily caloric intake of 2,400.

MATERIALS

Thermometers, 250ml beakers, a source of heat

MATERIALS

GRADE 9-A 3

SUBJECT Science

CLUSTER Home Economics

JOB TITLE Dressmaker
Purchasing Agent

CONCEPT

Fabrics are different.

PERFORMANCE OBJECTIVE

The student will pass a written test on the difference in fabric samples revealed by the activity.

RECOMMENDATIONS

ACTIVITY Page 1 of 2

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I. SITUATION--Testing Fabrics

Fabrics are divided into two groups, natural fibers and manmade fibers. When selecting fibers for making clothing, it is essential that the fabric selected fits the use of the material.

II. STEPS

Select three or four fabrics from each group and perform the following tests showing a comparison of the results on tables or charts of your own design.

1) Cut ½-inch strips of the same length and hold each with tweezers or another device and heat each with a match flame or wood splint. Record the results; save and mark samples of residue.

2) Select colored strips of each and soak them in bleach such as Clorox. Try different concentrations (1:1, 1:10, 1:30). Record the results. Save and mark the samples.
   a) Note: the amount of time in the solution will affect bleaching. Use the same time interval for all samples.

3) Select your three samples of each and smear them with an ink pen. (Do not use water soluable ink.)
   a) Sample 1: Use commercial stain remover and warm water.
   b) Sample 2: Soak in hair shampoo and wash in warm water.
   c) Sample 3: Wash in regular detergent.
   d) Many variations and products may be used. Keep samples and record of results.

4) Pull several strands of each and place under microscope. Make a drawing of the results.

(continued)

MATERIALS

Samples of fabric: cotton, silk, wool, burlap, jute, linen (flax), polyester, rayon, nylon, acrylic, orlon acrylic; hair shampoo, a supply of beakers, bleach, detergent, commercial stain remover

MATERIALS

GRADE 9-A 3

SUBJECT Science

CLUSTER Home Economics

JOB TITLE Dressmaker
Purchasing Agent

II. STEPS

5) Extra project: If fabric is not too heavy, select samples and mount them in 35mm slides. Then project them on a screen. This is a great procedure to study weave.

GRADE 9-A 4

SUBJECT Science

CLUSTER Home Economics
Consumer Education

JOB TITLE Teacher
Candymaker
Homemaker
Grocery Clerk

CONCEPT

Each scale reads differently; however, the method of interpretation is the same for all scales.

PERFORMANCE OBJECTIVE

The student will demonstrate his ability to interpret scales.

ACTIVITY Page 1 of 2

I. SITUATION--Investigating Graduated Scales

A student comes to you with a ruler and asks what the little marks are. Then he/she asks the same question concerning a graduate, a thermometer, a meter stick and the marks on a double or triple beam balance. It is important that students are taught how to read scales before they are taught how to bake a cake, make candy or weigh a pound of onions in the supermarket.

II. STEPS

1) Make a collection of graduated cylinders and record them in the table below.

2) Select any number and record it as high no. Select the first lower no. and record it. Find the difference and record. Count the spaces between the two numbers and record. Divide the differences by the number of spaces. This number will be the milliliters per space.

(continued)

ml	High no.	Low no.	Difference	Spaces	Difference/space
25					
50					
100					
250					
500					
1000 and others					

RECOMMENDATIONS

MATERIALS

A collection of graduated cylinders, size unimportant; a collection of thermometers; rulers, beam balance; metersticks

MATERIALS

GRADE 9-A 4

SUBJECT Science

CLUSTER Home Economics
Consumer Education

JOB TITLE Teacher
Candymaker
Homemaker
Grocery Clerk

II. STEPS

3) On a similar table, investigate Celsius (centigrade) and Fahrenheit thermometers.

4) The system may be used to investigate the divisions of a ruler and meter sticks.

5) The system may be used to investigate the spacings on beam balances or the vegetable balance in the supermarket.

GRADE 9-A5

SUBJECT Science

CLUSTER Economics
Consumer Education

JOB TITLE Grocery Clerk
Dietitian

CONCEPT

Weighing can be rapidly completed, combining speed with accuracy.

PERFORMANCE OBJECTIVE

Students, after practice, will demonstrate their ability to weigh with speed and accuracy.

ACTIVITY

I. SITUATION--Weighing with Skill and Accuracy

Volume measurement of a cup of flour is inaccurate. How much of the volume is trapped air? From cake mixes to drugs, ingredients must be accurately weighed. Food must be weighed for special diets. The vegetables at the supermarket are sold by weight. The more complicated weighing systems start with simple basics.

II. STEPS

1) Check the balance for freedom of all moving parts. Wash and dry the pan or pans.

2) Place all sliders on the (single, double or triple) beam, balances to zero. Balance the beam with the adjustment screw.

3) Select an unknown weight in excess of 500 grams and place it on the pan.
   a) Move the largest beam slider toward the end of the beam until the beam becomes too heavy, then slide it back one notch.
   b) Do the same with the next largest slider.
   c) Make the final balance with the third and smallest slider.

4) Add the gram value of each beam and record the results, properly placing the decimal point.

5) Auxiliary weights may be placed on the hooks at the end of the beam to act as the equivalent of a fourth beam.

6) The same procedure may be used with a double pan balance, starting with the largest weight first.

RECOMMENDATIONS

MATERIALS

Several beam or pan balances and a complete set of weights for each double pan balance

MATERIALS

GRADE 9-B'

SUBJECT Science

CLUSTER Industrial Arts

JOB TITLE Electrical Engineer
Electrical Repairman

CONCEPT

A magnetic field is used to generate electricity.

PERFORMANCE OBJECTIVE

The students will be required to:

1) draw a magnetic field of like and opposite poles,

2) explain how alternating current is produced,

3) explain how to increase or decrease the strength of a magnet.

RECOMMENDATIONS

ACTIVITY Page 1 of 2

I. SITUATION--Generate an Electric Current

When a conductor is forced to move through a magnetic field, an electric current is produced.

II. STEPS

1) Thumbtack an overhead transparency to two wood strips slightly thicker than the height of a horseshoe magnet.

2) Place a transparency on the overhead. Place a horseshoe magnet on top of it. Then place the wood-striped transparency over the magnet.

3) Focus on screen and slowly sprinkle iron filings until a definite pattern is formed. Make a drawing of the pattern. Remember, lines of force never cross.

4) Use two magnets and show a field of opposite poles. Make a drawing.

5) Reverse the magnets and make a drawing of a field of opposite poles.

6) Wind a coil of insulated wire so it will slip over the pole of a magnet. Connect it to a galvanometer, regular or overhead type.

7) Slowly move the coil back and forth over the prong of the magnet. The back and forth deselection of the meter indicates alternating current.

8) Speed up and slow down the motion to show an increase or decrease in current.

9) Show that no current is produced when the motion is stopped. Conclude that current is produced only when motion cuts magnetic lines of force.

(continued)

MATERIALS

Insulated wire, overhead transparencies, two or more horseshoe magnets, iron cone, iron filings, nails

MATERIALS

GRADE 9-B'

SUBJECT Science

CLUSTER Industrial Arts

JOB TITLE Electrical Engineer
Electrical Repairman

II. STEPS

10) Electro-magnet: Remove the coil from the meter and connect it to a source of dc current, 6 to 12 volts. Connect an off and on switch in the circuit.

11) Place an iron cone in the coil, close the switch and pick up iron filings or nails.

12) If possible, increase or decrease the current; test the results.

13) Unwind a few coils and test the loud results.

14) What determines the strength of an electric magnet?

GRADE 9-B[2]

SUBJECT Science

CLUSTER Industrial Arts

JOB TITLE Drafting

CONCEPT

Basic skills in horizontal and vertical distances, latitude and longitude, and contour lines are essential to locate the land forms portrayed by the map.

PERFORMANCE OBJECTIVE

Students will be able to design a make-believe topographic map from information supplied by the teacher.

ACTIVITY

I. SITUATION--Interpretation of Maps

There are many occupations that make use of topographic maps, including the civil engineer, geologist, recreationist and forester. A topographic map referred to as a quadrangle is of value only to the extent that it can be interpreted.

II. STEPS

1) Select a topographic map, such as the Boise Quadrangle, and accurately demonstrate in drawing the three methods used to show the scale of the map.

2) Demonstrate by a drawing the comparative sizes of 30, 15 and 7½ minute quadrangles. Consult an earth science book for assistance.

3) In a drawing, show the latitude and longitude of each corner of your map. Show what the latitude would be of the next map east and west of your map.

4) Demonstrate the use of contour lines and four other methods of showing elevation.

5) After inspecting a topographic map, invent drawings using contour lines to show a mountain peak, a long ridge, a cliff, a crater or depression, and the direction of flow of a stream that has one tributary.

6) Rules for drawing contour lines: a) contour lines never cross; b) they are either closed curves or must run off the edge of the map boundary.

7) Advanced drafting problems for a topographic map:
   a) Calculate the gradient of streams.
   b) Construct profiles of river valleys, mountains, etc.

RECOMMENDATIONS

Help the students establish rules for drawing contour lines.

MATERIALS

Topographic maps and drawing equipment

MATERIALS

GRADE 9-B[3]

SUBJECT Science

CLUSTER Industrial Arts

JOB TITLE Engineer

CONCEPT

A special use calls for a special metal or a special form of the metal.

PERFORMANCE OBJECTIVE

The student should pass a test on the following:(70% accuracy)

1) use of the metals

2) physical properties of metals

3) selecting metals for special uses

ACTIVITY

I. SITUATION

Investigating the physical properties of iron, copper, aluminum and lead.

Each metal has definite physical properties that determine its use:

1) malleability
2) flexibility
3) heat conductivity
4) melting point
5) corrosion

II. STEPS

1) Look up in a chemistry book or other source some uses of each metal.

2) Vigorously pound a sample of each metal on an anvil.

3) Fasten a piece of each metal in a vice and forceably flex back and forth; break if possible.

4) Keep time on how long you can hold equal size pieces of each metal in a flame.

5) Test melting point by heating small chunks of each in a small crucible.

6) Heat each in an open flame; note flame color.

7) Place samples of each in water and then copper sulphate.

8) Acid H_2SO_4. Allow to remain overnight, if necessary.

Note: Keep accurate records of the results of each test.

Note: The same metal in different forms may have different properties.

RECOMMENDATIONS

Class discussion on the use of these metals

MATERIALS

Sheets of foil and wire; chunks of copper, iron, lead, aluminum (don't overlook can of all kinds as a source of aluminum or iron); acid H_2SO_4; copper sulphate; tinsnips; hammers; pieces of iron for anvils; source of heat (burner-type); small crucibles from chemistry lab

MATERIALS

GRADE 9-B 4

SUBJECT Science

CLUSTER Industrial Arts

JOB TITLE Cement Contractor

CONCEPT

Common materials can be made into valuable products.

PERFORMANCE OBJECTIVE

The student will pass a written examination on:

1) materials used to make cement,

2) materials used to make concrete,

3) how to make and finish concrete

with 70% accuracy.

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ACTIVITY

I. SITUATION -Making a Sidewalk

All of man's resources come from the land, water or air. Some of the most abundant materials in the crust of the earth are the most usable; such as sand, gravel and clay. These are used in making cement and, finally, concrete.

II. STEPS

1) Learn from an earth science text how nature sorts out sand, gravel and clay.

2) Look up in a chemistry book the ingredients for making cement(powdered lime, clay and gypsum) and the process.

3) Mix 5 parts of sand, 1 part of gravel and 1 part of cement. Add water, taking care not to get the mixture too wet.
   a) Note: you may change the mix and amount of water as desired.

4) Cut the side out of a milk carton and pour the mixture into it. Use cardboard spacers to represent expansion joints. Tamp edges to eliminate holes when box is removed.

5) Surface may be smooth to rough. Sprinkle a mixture of 1 part fine sand to 1 part cement on damp surface and trowel down for smooth finish. Sprinkle with water, if necessary.

RECOMMENDATIONS

MATERIALS

Sand, gravel, cement, mixing bowls, milk cartons

MATERIALS

GRADE 9-B5

SUBJECT Science

CLUSTER Industrial Arts

JOB TITLE Cabinetmaker

CONCEPT

Density of wood

PERFORMANCE OBJECTIVE

The student will demonstrate to the instructor that he/she can accurately measure and weigh wood blocks and calculate their densities.

ACTIVITY

I. SITUATION--Density: A Volume-Weight Relationship

Are you building a house? Are you selecting wood for a do-it-yourself home project? Is it a load of wood for the fireplace? Find its density. It is one of wood's physical properties that will help you make your selection.

II. STEPS

1) Accurately cut wood into rectangular shapes and number the blocks. The following list suggests a few kinds, but do not limit yourself to this list:

a) hardwoods
b) fir
c) plywood
d) cherry
e) apple
f) poplar
g) oak

2) Measure the length of each sample to the nearest millimeter.

3) Weigh each sample to the nearest tenth or hundredth of a gram, depending on accuracy of available balances.

4) Calculate the density: $D = \frac{\text{weight in grams}}{\text{volume in cm}^3} = \frac{g}{cm^3}$
Stress proper labels.

5) If possible, relate uses of wood to density. Ask shop instructor for advice.

RECOMMENDATIONS

MATERIALS

Blocks of wood, metric rule, balances that are accurate to one-tenth of a gram

MATERIALS

GRADE 9-C'

SUBJECT Science

CLUSTER Art and Humanities

JOB TITLE Jewelry-Maker

CONCEPT

The shape of the crystal is a method of identifying a mineral.

PERFORMANCE OBJECTIVE

Students will be able to pass an oral interview on source and identification of common crystals.

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RECOMMENDATIONS

ACTIVITY

I. SITUATION--Investigating Crystals

Jerry looks into a jewelry shop window and can see a collection of beautiful crystals on display. Intrigued by their many shapes and colors, Jerry ponders the possibility of identifying them. Some of them will be used to make jewelry. Some, no doubt, are more valuable than others. Jerry proceeds with an investigation.

II. STEPS

1) Research the following topics:
   a) How are crystals formed in nature?
   b) What rock groups should be explored for crystals?
   c) Why are some crystals found in random locations far from their original source?

2) Look up crystal forms in a mineral handbook and make drawings of ten common crystals.

3) After the drawings are completed, compare them with the actual samples. Name each sample and write down its characteristics, including its hardness on the Mohs' Scale. Select three or four crystals and explain why you think they may be valuable.

4) Earth science laboratory manuals frequently contain patterns for making crystals.* Have the students make crystal models from heavy paper or appropriate material to represent the different crystal systems.

5) Invite a hobbiest to give a demonstration of cutting gem stones into their facets.

MATERIALS

*One manual is "Earth and Space Science" by Wolfe, Batton and others published by "Health". Obtain ten or more crystal samples: quartz, amethyst, garnet, calcite, pyrite, galena, sphalerite, halite, apatite, flourite (consult mineral handbooks for others)

MATERIALS

GRADE 9-C[2]

SUBJECT Science

CLUSTER Art and Humanities

JOB TITLE Photographer
Art Designer

CONCEPT

You can send a message with pictures.

PERFORMANCE OBJECTIVE

The finished product speaks for itself.

Each student will make a written message of his/her own collage and of two or three other students' work. Compare the messages.

ACTIVITY

I. SITUATION--Making a Brochure

A Chamber of Commerce is desirous of a brochure featuring activities of its service area. A photographer suggests a collage of the era's scenic, industrial and historic background. A scenic loop map is also suggested.

II. STEPS

1) The students are to obtain an era map and make a list of the following:
   a) Major Industries
   b) Scenic Areas or Views
   c) Special Geologic Formations
   d) Parks and Recreational Facilities
   e) Special Buildings and Historical Landmarks

2) After the above investigation, the photographer will select a group of desirable places and proceed on a professional basis. Students will select and cut out colored pictures from old magazines. Make certain that each of the groups in step #1 are represented. The pictures can then be mounted as a collage, the size being specified by the instructor.

3) For added interest, the collages could be photographed and made into a slide presentation.

4) Many subjects could be used besides the suggested one. However, each should be researched before collecting pictures. Suggestions:
   a) Boating and Water Sports
   b) Down on the Old Farm
   c) Geologic Formations
   d) The Desert, Its Plants and Animals
   e) Clouds Over Desert and Mountains
   f) Natural Resources of an Area

RECOMMENDATIONS

MATERIALS

Old magazines, colored pictures, a set of maps, posterboard, etc.

GRADE 9-C[3]

SUBJECT Science

CLUSTER Fine Arts and Humanities

JOB TITLE Jeweler
Designer of Costume Jewelry
Rockhound

CONCEPT

The physical property of hardness helps determine the use and value of semi-precious stones.

PERFORMANCE OBJECTIVE

The student will demonstrate his/her ability to determine the hardness of minerals by following through with the steps in the activity.

RECOMMENDATIONS

ACTIVITY

I. SITUATION--Investigating the Hardness of Minerals

Jerry is on a vacation with his family. They are visiting a souvenir shop. Jerry is intrigued with a collection of polished stones. Nearby are some stones made into costume jewelry. Jerry begins to ask questions such as, "Why did they choose certain stones and omit others for this collection of jewelry?"

II. STEPS

1) Research in an appropriate reference book the physical properties of minerals. Select about ten and attempt to list them in related groups. In a separate group list three that would be of special interest in making jewelry from semi-precious stones.

2) Look up in a mineral handbook Mohs' Hardness Scale and copy it onto the following table:

HARDNESS	MINERAL EXAMPLE	COMMON SUBSTANCE WITH THE SAME HARDNESS
1 to 10		

3) Select ten common minerals (not rocks) such as agate, quartz, garnet, mica, etc. From your knowledge gained in researching steps #1 and #2, complete the table on the next page. Hardness may be determined by comparing the samples with the samples in Mohs' Hardness Kit or with common substances of the same hardness.

MATERIALS

Samples of common minerals, earth science books, mineral handbooks, Mohs' Hardness Testing Kits.

MATERIALS

GRADE 9-C[3]

SUBJECT Science

CLUSTER Fine Arts and Humanities

JOB TITLE Jeweler
Designer of Costume Jewelry
Rockhound

II. STEPS

3a) Caution: Before assigning hardness numbers, be sure an actual scratch is made by the sample, not a streak.

MINERAL NAME	HARDNESS	COLOR LUSTER
1 2 3 etc		

4) After completing step #3, select three of your minerals and tell why you think they would qualify for semi-precious stones.

5) If equipment is available, attempt to polish some of the stones.

GRADE 9-C 4

SUBJECT Science

CLUSTER Arts and Humanities

JOB TITLE Photographer

CONCEPT

Photography starts with the three basic camera controls: time, distance and f-stop.

PERFORMANCE OBJECTIVE

The student will be able to discuss orally or in writing the use of the three basic camera controls.

RECOMMENDATIONS

The activity is for a 35mm slide camera; but it can be improvised to fit any camera.

ACTIVITY Page 1 of 2

I. SITUATION--In the Beginning There Was Light "Photography"

Would-be photographers usually see themselves as developing films, mixing chemicals and making enlargements. Much of this is accomplished mechanically with no great skills needed. The real photographic skills consist of selection of materials, equipment, processes and subjects. In the beginning, it all starts with three basic controls: speed, f-stop and distance.

II. STEPS

1) Secure an old camera that is equipped with the three control devices: speed, f-stop (size of shutter opening) and distance. It is convenient to mount the camera on a tripod; however, stools can be used.

2) Mount a piece of wax paper in a 35mm slide frame and seal it as if it was a slide. Take the back of the camera and tape the slide in such a position that it would replace the film.

3) Set the time lever on "B". On this setting the shutter will stay open as long as the shutter release button is depressed. Point the camera across the room toward a distant light source and observe the size of the light spot on the wax paper for each f-stop, usually from 22 (small opening) to the smallest f-stop number (largest opening). Make a record of your observations.

a) Note: if it is difficult to observe the light spot, cover the camera and your head with a large dark cloth during each observation.

(continued)

MATERIALS

Old camera, tripod, black cloth for hood

MATERIALS

GRADE 9-C 4

SUBJECT Science

CLUSTER Arts and Humanities

JOB TITLE Photographer

II. STEPS

4) With the time still set on "B", move the f-stop to one of the middle numbers. Depress the shutter release button and focus images on the wax paper slide for measured distances of 5, 10, 15, 20 and 30 feet away. At some point any distant object will be in focus. Make a record of your results. (Use the black hood.)

5) With the f-stop still on a middle number, set the time on each time setting. Press the release button several times for each time setting and record your results. (Use the black hood.)

6) With the distance set on infinity, make up combinations between f-stops and time. Record your choices and results.

7) Proper light on film is essential to good pictures.

8) Explain in writing how time and f-stops can together control the amount of light that reaches the film.

GRADE 9-D'

SUBJECT Science

CLUSTER Business and Office

JOB TITLE Custodian

CONCEPT

The amount of moisture in the air controls evaporation and helps regulate body temperature.

PERFORMANCE OBJECTIVE

The student will demonstrate his/her ability to determine relative humidity and dew point. He/she should be able to suggest some practical use of the information.

ACTIVITY Page 1 of 2

I. SITUATION--Proper Humidity Saves Energy

The custodian of an office set the thermostat at 68°F to conserve energy. Sometime later the manager informed him that there had been complaints about not having enough heat. The custodian suggested that the real problem was humidity, not heat, and suggested an investigation.

II. STEPS

1) Obtain two thermometers. Bind cotton cloth to the bulb of one and hang both of them in front of a fan for three minutes. Record the temperature on the chart below.

2) Wet the cotton on the bound thermometer in a glass of water. Put it in front of the fan again for three minutes and record the wet temperature on the chart.

3) Find the difference between the dry bulb and wet bulb reading. Determine the relative humidity from a humidity table by using the dry bulb reading and the difference. (continued)

	Dry Bulb	Wet Bulb	Difference	Relative Humidity %	Capacity	Absolute Humidity	Dew Point
1)							
2)							
3)							
4)							
5)							

RECOMMENDATIONS

MATERIALS

2 thermometers, cotton, humidity tables and capacity charts from physical science texts or lab books

MATERIALS

GRADE 9-D'

SUBJECT Science

CLUSTER Business and Office

JOB TITLE Custodian

II. STEPS

4) Multiply the relative humidity by the capacity to find the absolute humidity.

5) Read the capacity chart backwards to find the dew point.

6) Take the humidity morning and afternoon each day for five to ten days and record it on the table.

7) Determine from the chart if there are times of days or times of weeks when the relative or absolute humidity is lower than at other times.

8) Make recommendations to the manager.

9) Note: The last three columns from the chart may be dropped; however, the absolute humidity figures may be more convincing than relative humidity.

GRADE 9-D[2]

SUBJECT Science

CLUSTER Business and Office

JOB TITLE Salesman

CONCEPT

Each appliance carries a nameplate containing the necessary information to determine its power consumption and safety use.

PERFORMANCE OBJECTIVE

The student will completely interpret all information found on an appliance nameplate.

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ACTIVITY Page 1 of 2

I. SITUATION--Power Consumption: Is It Safe?

A salesman in a small appliance department discovers that his customers are asking more questions than usual about energy consumption of small appliances. They also ask, "Will it work on the same circuit as my TV or some other appliance?" This calls for an investigation.

II. STEPS

1) Select ten or more small appliances found in your home and from their specifications determine the information called for in the following table:

NAME	VOLTAGE 115-120	AMPERES	WATTS
Toaster			
Mixer			
Etc.			

2) Frequently, the amperes are not given. It can be calculated by:

$$\text{amperes} = \frac{\text{watts}}{\text{volts}}$$

3) Power costs can be estimated by calculating the average kilowatt power cost. This is determined by dividing the cost of the total billings by the kilowatts used during any month.

4) For your appliance cost per hour use, divide the watts from the table in step #1 by 1,000 and multiply by the average price per kilowatt. It looks small, indeed!

RECOMMENDATIONS

MATERIALS

MATERIALS

GRADE 9-D

SUBJECT Science

CLUSTER Business and Office

JOB TITLE Salesman

ACTIVITY

II. STEPS

5) With the help of adults or parents, determine the number of circuits that lead to your wall outlets. Complete the chart for each circuit:

NUMBER	AMPERES FOR FUSE	NUMBER OF OUTLETS	APPLIANCES ON CIRCUIT AND AMPS	TOTAL AMPS
1			a) b) c) etc	
2 etc				

6) Compare the total amperage with the fuse amperage. Do you have a margin of safety?

GRADE 9-E

SUBJECT Science

CLUSTER Communication and Media

JOB TITLE Teacher

CONCEPT

Weathering changes rocks to soil; erosion transports the soil.

PERFORMANCE OBJECTIVE

Each student will be able to orally explain the difference between weathering and erosion.

ACTIVITY

I. SITUATION--Say It with Pictures

A teacher finds that the students are repeating memorized definitions with little understanding of their meanings. A picture concept is then used to supplement the written material.

II. STEPS

1) Look up in a physical science or earth science text the processes of weathering.
   a) List the chemical agents.
   b) List the mechanical agents.

2) Look up in the same text the process of erosion.
   a) List the agents of erosion.

3) Describe how gravity aids weathering and erosion.

4) On a sheet of posterboard, 14 X 20 inches, make a collage from old magazines to represent the students' idea of:
   a) weathering and its agents
   b) erosion and its agents
   c) (Note: Use rubber cement to mount the pictures.)

5) Other topics in pictures:
   a) Diastrophism
   b) Seashore topography
   c) Land forms such as plains, plateaus, and mountains

RECOMMENDATIONS

MATERIALS

Rubber cement; supply of old magazines, catalogs and imagination

MATERIALS

GRADE 9-F

SUBJECT Science

CLUSTER Recreation

JOB TITLE Guide

CONCEPT

To be useable, a compass must be corrected for declination.

PERFORMANCE OBJECTIVE

The student will demonstrate with drawings and actual use that he/she can use a compass.

ACTIVITY

I. SITUATION--How to Use a Compass

A compass does not always point to geographic north. It usually points to magnetic north unless local variations change its direction. The angle between geographic north and magnetic north is declination. For a compass to be useful, the operator must know the declination of his/her area.

II. STEPS

1) From an isogonic map of North America or U. S., find the agonic line. These maps are found in earth science books and some scouting and exploring books.

2) Identify the following: agonic line
isogonic line

3) Select a point east of the agonic line and draw a triangle connecting your point to the north pole and magnetic pole.

4) Move your point west of the agonic line and draw a triangle for Boise.

5) Explain in writing and drawings what is declination.

6) If possible, inspect topographic maps of the area for more accurate declination.

7) Set a compass so that it is free from the influence of metal or electrical devices. Rotate the compass until the needle points to the number of degrees selected for the declination. "N" on the compass should point north.

RECOMMENDATIONS

MATERIALS

One small compass for each two or three students; several sets of isogonic maps from earth science lab books

MATERIALS

GRADE 9-F

SUBJECT Science

CLUSTER Recreation

JOB TITLE Guide

ACTIVITY

II. STEPS

8) Local variation may influence a compass: Set it up under a transformer pole or fire hydrant and observe.

9) In the hills, etc., local variation is limited to deposits of iron. (Scrap iron might also be located.)

GRADE 9-G

SUBJECT Science

CLUSTER Environmental Control

JOB TITLE Fish Biologist

CONCEPT

Increased temperature increases chemical activity.

PERFORMANCE OBJECTIVE

The teacher will have each student write a satisfactory summary, under test conditions, having access to all of the investigation data collected by that student.

RECOMMENDATIONS

ACTIVITY

I. SITUATION--Thermal Pollution of Water

Jerry read in the local paper that water in a large reservoir was considered polluted because storage had increased its temperature. He consulted his science teacher, who gave him the following investigation to do.

II. STEPS

1) Look up in a chemistry book or other source and make a written record of situations where heat will produce increased chemical change.

2) Fill two beakers with about 300ml of tap water; mark them A and B. Fill the babyfood jar with water from a fish tank, put in a fish and cap the jar. Place the babyfood jar, with the fish in it, in beaker A with a thermometer. After allowing time for the water in the two jars to reach the same temperature, record the thermometer reading (centigrade). Count the number of breathing movements of the fish for 20 to 30 seconds. Make three trials and average the results.

3) Move the fish bottle to beaker B and heat the water to 35°C. (Note: Do not heat too rapidly or go beyond 35°C.) Again count the fish's breathing, taking the average of three trials. Record your observations as well as any special observations you make about the fish. (Caution: Do not use the fish for a similar investigation for at least one day.)

4) Write a summary or conclusion of your results. Be specific and give details.

MATERIALS

2 500ml beakers, one babyfood jar and 1 goldfish per student team; alcohol burners, thermometers

MATERIALS

GRADE 9-H

SUBJECT Science

CLUSTER Personal Service

JOB TITLE Landscaper
Gardener
Caretaker

CONCEPT

Landscaping and gardening calls for a broad knowledge from many scientific fields.

PERFORMANCE OBJECTIVE

The student will be able to write a summary of the subject areas that are used by landscapers and gardeners.

ACTIVITY Page 1 of 2

I. SITUATION--Problems of Landscaping

There are many well-paying jobs in landscaping, gardening and caretaker work on private properties. These jobs include the original design and landscaping as well as care and maintenance of established estates. The following investigation includes some of the problems to be solved.

II. STEPS

1) Make a map drawn to scale of your lot. Include walk, driveways, flower gardens, hedges, shrubbery, trees, etc.

2) Look up, in an appropriate source, information about the following plant groups. List some plants from each group common to your area.
   a) annuals
   b) biannuals
   c) perennials

3) Collect soil samples of clay, sand, mountain soil, sandy loam, etc. Place each sample in a berry cup and, when all are collected, water them well, making sure they are well-soaked. Allow them to stay at room temperature for several days without additional water. Check each day for soil hardness and moisture content. In about a week, test them to see how each absorbs water. Keep a written record.

4) Collect samples of sod (various kinds of grass) about one foot square and two or three inches thick. Blast each sample with a stream of water from a garden hose equipped with a nozzle. Note which sample holds the soil in place the longest. Examine and describe the root structure.

RECOMMENDATIONS

MATERIALS

Public library, school library, Weather Bureau, garden supply shops,etc.

MATERIALS

GRADE 9-H

SUBJECT Science

CLUSTER Personal Service

JOB TITLE Landscaper
Gardener
Caretaker

II. STEPS

5) Research the Weather Bureau for the following weather and climate information for your area.
   a) average monthly rainfall
   b) average monthly temperature: plot on a graph
   c) dates for killing frost, spring and fall
   d) warmest temperatures
   e) coldest temperatures
   f) wind direction and velocity

6) Many other topics could be added.

GRADE 9-I'

SUBJECT Science

CLUSTER Manufacturing

JOB TITLE Metallurgist

CONCEPT

An electrolytic cell can be used to plate one metal with certain other metals.

PERFORMANCE OBJECTIVE

The student should describe in writing and drawings how to use an electrolytic cell for copper plating or purifying copper.

ACTIVITY

I. SITUATION--The Electrolytic Cell Plating a Metal with Another Metal

A student asks you the following questions:

1) How can copper wire by made 100% pure?

2) How are parts of a sports car coated with chrome?

3) How do they make a silver trophy cup?

II. STEPS

1) Research in a physics textbook the construction of an electrolytic cell. Make a diagram of its construction.

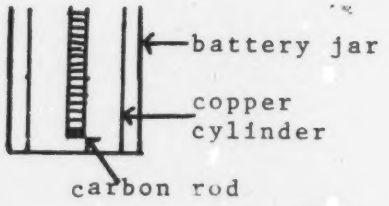
2) Remove the carbon rod from an old dry cell.

3) Roll a thin sheet of copper into a cylinder so that it will have a diameter of about three inches. The cylinder should be about as high as the carbon rod when they are sitting on their ends.

4) Fill a battery jar about 3/4 full of copper sulphate solution.

5) When the carbon rod is inside the cylinder, place them in the solution.

6) Connect the carbon rod to the negative terminal of a DC source of power and the copper cylinder to the positive terminal. Use a six to twelve volt system.



7) After fifteen to twenty minutes, observe the carbon rod.

RECOMMENDATIONS

MATERIALS

Old dry cells, battery jar, copper sulphate, power source DC 6 to 12 volts, connecting wires, 6-inch wide sheet of copper that is very thin

MATERIALS

GRADE 9-I'

SUBJECT Science

CLUSTER Manufacturing

JOB TITLE Metallurgist

ACTIVITY

II. STEPS

8) Explain how the process can be used to refine copper.

9) Explain the alterations needed so the cell can chrome-plate a part for a car.

GRADE 9-12

SUBJECT Science

CLUSTER Manufacturing

JOB TITLE Production Specialist

CONCEPT

1) Some liquids conduct electricity and some do not.

2) A dry cell is not really dry.

PERFORMANCE OBJECTIVE

The student will be able to:

1) group the materials according to whether they are conductors or nonconductors;

2) make a cross-section of a dry cell and name the chemicals used. Which one is the conductor? Which one supplies water?

RECOMMENDATIONS

I. SITUATION--Conductivity of Solutions

Many processes are based upon the ability of solutions to conduct an electric current. Dry cells, wet cells and the refining of metals, such as copper and aluminum, are examples.

II. STEPS

1) Dissolve the following substances in water, about 2 grams per 100ml of water:

a) sodium chloride
b) sodium hydroxide
c) ammonium chloride
d) liquid detergent
e) granular detergent
f) copper sulphate
g) 25cc of alcohol
h) hand soap
i) antifreeze
j) oil
k) sugar

2) Test each solution with a conductivity apparatus and record the results on a table.

a) Note: Always make the observations with the electrodes the same distance apart.

b) There are two types of conductivity apparatus: the meter type used in the coarse interaction of matter and energy and the light type which employs a 60, 75 or 100 watt light bulb. The latter type can be made by using a five-inch porcelain light socket and heavy copper wires for electrodes. This is a good setup because different size bulbs can be used to determine the flow of current.

MATERIALS

6 100ml beakers per group of students; sodium chloride, sodium hydroxide, ammonium chloride, liguid detergent, granular detergent, copper sulphate, alcohol, hand soap, antifreeze, oil, sugar

MATERIALS

GRADE 9-I[2]

SUBJECT Science

CLUSTER Manufacturing

JOB TITLE Production Specialist

ACTIVITY Page 2 of 2

II. STEPS

3) Cut up an old dry cell and make a solution from the parts found within. Test this material.

4) Make up a cross-section drawing of a dry cell.

5) Look up the chemicals used to make a cry cell.

6) Where does the water come from for a dry cell?

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GRADE 9-J

SUBJECT Science

CLUSTER Transportation

JOB TITLE Dispatcher
Ticket Agent
Travel Bureau Manager

CONCEPT

The world turns through 15° of longitude each hour.

PERFORMANCE OBJECTIVE

Students will be able to determine arrival times and dates when departure times are given.

ACTIVITY

I. SITUATION--What Time Is It, When and Where?

A world traveler approaches the ticket desk. The clerk pulls out a book and from prepared tables begins to read departure and arrival times. How is the book made? How often is it changed? How about out-of-the-way places? How about local time differences? How about starting at the very beginning for some answers?

II. STEPS

1) Look up the usage of latitude and longitude.

2) On a world globe, locate the following:
   a) prime meridian
   b) equator
   c) International Date Line
   d) 0° latitude and 0° longitude
   e) latitude and longitude of your home town

3) Turn a sheet of paper so the lines are running up and down, find the center line and mark it 0°. Number the other lines in 15° intervals going right and left until each comes to 180°. Remember, the 180° lines are the same line, the International Date Line.

4) Use the chart from step #3 to figure the arrival times and dates for the chart on the next page. The longitudes and times of departure are given.

RECOMMENDATIONS

MATERIALS

World globe, large ice cream cartons, geography books, earth science books, time zone maps

MATERIALS

GRADE 9-J

SUBJECT Science

CLUSTER Transportation

JOB TITLE Dispatcher
Ticket Agent
Travel Bureau
Manager

ACTIVITY

II. STEPS

DEPARTURE			ARRIVAL		
Longitude	Time	Date	Longitude	Time	Date
120°W	10 pm	5/1/74	165°E	?	?
45°E	6 am	12/21/74	150°W	?	?
150°W	11 am	4/6/74	165°E	?	?
105°E	9 pm	4/5/74	150°W	?	?
15°W	4 am	7/16/74	150°E	?	?
90°E	9 pm	6/1/74	75°W	?	?

a) Other departure times may be assigned by the instructor.
b) The lines in step #3 may be evenly spaced around a large ice cream carton instead of a sheet of paper. The departure time can be placed on a small strip of paper and clipped to the departure latitude.
c) A world traveler who has been turning his clock forward turns his calender backward when crossing the International Date Line. If he has been turning his clock backward, he turns his calender forward.

GRADE 9-K

SUBJECT Science

CLUSTER Health Occupations

JOB TITLE Custodian
Homeowner
Nursery Supervisor

CONCEPT

Temperature variations exist in nearly every room. Do these variations affect the use of the room?

PERFORMANCE OBJECTIVE

The students will demonstrate their ability to use thermometers as specified by the instructor.

ACTIVITY

I. SITUATION--Investigation of a Heat Field

Man is aware of outside temperature variations. To locate these variations, isotherms are used to connect areas of equal temperature. Isotherms can be used to check temperature differences in a room or living area of a home. Do you have a cold area where your child plays?

II. STEPS

1) Look up in a text or other source the use and meaning of an isotherm.

2) Draw to scale the enclosed room or area to be checked.

3) Lay the room out in a grid system determining ten to fifteen temperature stations. Registers, windows, doors, etc. should be included.

4) Take the floor temperature at each station and record it on the grid. Use the thermometers graduated to ten per space or less. Estimate half degrees. The same thermometer must be used at all grid points for accuracy. However, if a check shows that the thermometers have identical readings, several may be used.

5) Retrace the scale drawing and grid on a new page and record the temperatures taken at tabletop height.

6) Repeat step #5, taking temperatures at doortop height.
   a) Note: The temperatures may be placed on the same grid using different colored inks; this is usually mass confusion for the beginner.

(continued)

RECOMMENDATIONS

MATERIALS

10 or more Fahrenheit or centigrade thermometers for a class of 20 to 25 students; drawing paper and rulers

MATERIALS

GRADE 9-K

SUBJECT Science

CLUSTER Health Occupations

JOB TITLE Custodian
Homeowner
Nursery Supervisor

II. STEPS

7) Draw in the isotherms and compare the temperatures. Locate the hot and cold areas. Is the temperature satisfactory for:
   a) small children?
   b) adults?
   c) work calling for movement?
   d) work calling for limited motion?

8) Recommend improvements.

9) The grid may be place on an overhead transparency and projected fo. class study.

GRADE 9-L

SUBJECT Science

CLUSTER Public Service

JOB TITLE Meteorologist

CONCEPT

The rising and falling barometer is a clue to weather conditions.

PERFORMANCE OBJECTIVE

The students will be able to pass a test by drawing a mercury barometer, giving the average sea level pressure units and explaining the rise and fall of a barometer.

RECOMMENDATIONS

ACTIVITY

I. SITUATION--Researching the Barometer

Will it be good weather for the picnic tomorrow? Will it freeze the flowers tonight? Should I cut my hay? The weather concerns us all, each in our own way. Meteorologists use many instruments to forecast the weather; however, the barometer and the measurement of air pressure are the basic clues to a weather forecast.

II. STEPS

1) Look up in a physical science text the meaning and use of the term "pressure". Note the label 32 lbs/inch^2.

2) Look up the construction and operation of:
   a) mercury barometer
   b) aneroid barometer
   c) Make a drawing of a mercury barometer and give four pressure terms used in expressing average sea level pressure.
   d) Research and discuss the question which is the most valuable, a barometer reading or the barometer trend?

3) Look up the elevation of your school on a topographic map and use it to correct a barometer for sea level reading.

4) Determine from research how the following affects the barometer reading: a) warm air, b) cold air, c) dry air, d) moist air

5) From your information researched about barometers, make two general statements about weather conditions:
a) When the barometer trend is up, b) When the barometer trend is down.

MATERIALS

Physical science and earth science textbooks; mercury barometer, homemade or otherwise; aneroid barometers, usually available in school labs

MATERIALS

GRADE 9-M'

SUBJECT Science

CLUSTER Natural Resources

JOB TITLE Geologist
Prospector
Rock Hound

CONCEPT

Minerals can be identified by a study of one or more physical properties.

PERFORMANCE OBJECTIVE

1) The student will pass a test on the physical properties of the six most abundant minerals.

2) The student will demonstrate his/her ability to determine the specific gravity of mineral samples.

ACTIVITY

I. SITUATION--Mineral Identification: Specific Gravity

Most minerals can be identified by their physical properties:

Color: luster, streak
Cleavage: crystal shape, fracture
Hardness: specific gravity

II. STEPS

1) Look up in an earth science text the names and descriptions of ten common minerals.

2) Look up in a physical science textbook the meaning of specific gravity and the procedure for determining the specific gravity of a solid (mineral).

$$\text{Sp Gr} = \frac{\text{weight in water}}{\text{weight in air - weight in water}}$$

3) Weigh in air three to five common minerals; then suspend under balance pan and weigh in water. Calculate your results.

4) Compare your results with tables in earth science or rock identification books.

5) Additional work: Test for hardness, cleavage, crystal shape, fracture.

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RECOMMENDATIONS

MATERIALS

3 to 5 common minerals, balance pan

MATERIALS

GRADE 9-M[2]

SUBJECT Science

CLUSTER Agri-Business

JOB TITLE Soil Scientist

CONCEPT

Soil is the result of weathered rock.

PERFORMANCE OBJECTIVE

Students will be able to follow through with four of nine steps of the exercise.

420

ACTIVITY

I. SITUATION--Discover the Origin of Soil

Soil should resemble the parent material. Parent material for soil is unweathered rocks. Weathering releases the minerals that make up soil.

II. STEPS

1) Look up in an earth science book or other source the general description of soil horizons.

2) Find a road cut or other suitable place in the foothills and collect soil and small rocks from each soil horizon A and B and, if possible, C horizon.

3) Collect from the same or other areas pieces of easy-to-crush granite. Do not attempt to crush and use solid granite.

4) Each student is to be given a sample of horizon A and B soil and a sample of crushed granite,which they are not to mix.

5) Each student, with the aid of a hand lense or other source of magnification, identify the three or four kinds of mineral grains in granite.

6) Each student is to attempt to find similar mineral grains in each of the soil horizons.

7) If possible, compare the mineral grains soil horizon with crushed granite.

8) List the horizons in the order in which they best resemble granite.

9) Conclude the source material for soil.

RECOMMENDATIONS

Discuss the minerals formed in granite.

MATERIALS

Hand lenses, soil horizon samples and crushed granite

MATERIALS

GRADE 9-M3

SUBJECT Science

CLUSTER Environment and Control

JOB TITLE Researcher
Air Moniter

CONCEPT

Different materials produce different smoke densities and residue products.

PERFORMANCE OBJECTIVE

The students will be able to predict smoke density and burning speed of related materials.

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ACTIVITY

I. SITUATION--A Source of Air Pollution

After watching the fire department put out a rubbish fire, the students ask the teacher what caused the black smoke when only flames were visible. The teacher answers, "It depends upon what is burning."

II. STEPS

1) Place a sheet of white paper on a table. In a watch glass, place a small bit of cotton and set it in the middle of the paper. Light with a match and cover with a 500ml beaker. Note the color of smoke stains on white paper on beaker.

2) Soak cotton in turpentine and repeat with clean beaker, watch glass and paper.

3) Repeat with styrofoam.

4) Repeat with wool.

5) Other products may be used but should be teacher-tested before student use.

6) Students should make written observations for each test:
   a) speed of burning
   b) color of smoke
   c) color of flames
   d) color of stains on beaker
   e) color of white paper
   f) odor of smoke (take it very cautiously after flame is out)
   g) nature of residue

RECOMMENDATIONS

MATERIALS

4 500ml beakers or larger, 4 watch glasses, white paper, cotton, turpentine, styrofoam, wool, fabric from old car seats, etc.

MATERIALS

GRADE 9-N

SUBJECT Science

CLUSTER Marine Science

JOB TITLE Marine, Soil and Water Scientist

CONCEPT

Strata and sedimentary material are sorted and sized in nature.

PERFORMANCE OBJECTIVE

Students will explain and demonstrate orally how sediments form strata.

122

RECOMMENDATIONS

ACTIVITY

I. SITUATION--How Strata Is Formed

Man has an opportunity to observe processes that take place on the surface of the earth. He is not always observant of what happens at the interface between land and water.

II. STEPS

1) Fill a large glass graduate, about 250ml, with water. (Any clear glass tube 1½ inches in diameter with one end sealed will work.)

2) Collect sediments such as:
   a) clay
   b) fine sand
   c) coarse sand
   d) extra large sand
   e) small pebbles

3) Starting with the fine material, sprinkle each on a surface of water and record the time it takes it to reach the bottom. Make three tries and calculate the average.

4) Plot the results on a graph using the vertical for time and horizontal for size.

5) Is there a point on the graph where size no longer makes a difference?

6) Pour out about 1/3 of the water and add a mixture of sediments. Mix by turning over and back several times; then allow it to settle. Record observations after three trials.

7) Compare results with graphic results.

8) Use a tube of clear water and the finest possible material and mix by turning over and back as above. After the third try, add a solution of alum; but do not disturb tube. Note results.

9) Make a conclusion.

MATERIALS

Large glass graduate, various kinds of sediments, graph paper

MATERIALS

GRADE 9-0

SUBJECT Science

CLUSTER Marketing and Distribution

JOB TITLE Weather Consultant

CONCEPT

The Weather Bureau offers several special services that assist in the production and distribution of perishable products.

PERFORMANCE OBJECTIVE

The students will be able to summarize the steps in the activity in written form.

123

ACTIVITY

100

I. SITUATION--Learning About Weather Bureau Services

A Wyoming rancher has two carloads of cattle ready for market. A vegetable grower in Florida has several carloads of perishable vegetables ready for market. A broker is dealing with a Gem County farmer in cherry futures. A Kansas farmer has 10,000 bushels of unharvested wheat. It all depends upon the weather. What information is available that will assist in the marketing of these products?

II. STEPS

1) Note: Earth science and physical science textbooks frequently offer units on weather forecasting and services. Do not rely on just one text.

2) Make a list of the special services performed by the Weather Bureau.

3) Collect information on the following:
   a) Times of daily weather observations
   b) Times of forecast releases to TV and press
   c) The duration period for the advanced forecasts
   d) Time of revised forecasts
   e) Any related information

4) Learn from research how to make a station model. From a major TV weather report, using the same station and the same time of day, collect information and complete a station model for each of the seven days of the week. Be sure the information applies to your local area.

(continued)

RECOMMENDATIONS

MATERIALS

MATERIALS

GRADE 9-0

SUBJECT Science

CLUSTER Marketing and Distribution

JOB TITLE Weather Consultant

II. STEPS

5) From your experiences in research and following the weather reports, write a summary paper on what information is available for the production and marketing of perishable crops.

GRADE 9-P

SUBJECT Science

CLUSTER Construction

JOB TITLE Engineer
Party Chief

CONCEPT

Grandient calculated from a contour map is a key to land use.

PERFORMANCE OBJECTIVE

The student will be able to calculate the gradient of a stream.

ACTIVITY

I. SITUATION--Feasability Study for a Road

A group of sportsmen has requested that the road district build an access road into the foothills. There are many problems to be investigated, however. A check on the stream gradient in which the proposed road is to follow may reveal the project undesirable. This gradient check can be made from a topographic map.

II. STEPS

1) Look up in an earth science book the meaning and use of the following terms:
   a) contour line
   b) contour interval
   c) gradient

2) On a contour map such as the Boise Quadrangle, select three or more creeks or gulches and determine their gradient, using the following procedure:
   a) Locate and determine the elevation of the contour line just above the head of the creek.
   b) Locate and determine the elevation of the contour line at the lower end of the creek (start of road).
   c) Measure the two contour lines by following the stream. Use a sheet of paper, placing the first dot at the upper contour line and, by turning the paper, placing an additional dot for each bend of the stream until the lower contour line is reached. Match the edge of the paper with the map scale and convert into miles.
   d) Calculate the gradient as follows:

$$\frac{\text{High contour (feet)} - \text{Low contour (feet)}}{\text{Distance in miles}} = \text{gradient (feet/mile)}$$

(continued)

RECOMMENDATIONS

MATERIALS

MATERIALS

GRADE 9-P

SUBJECT Science

CLUSTER Construction

JOB TITLE Engineer
Party Chief

921 126

ACTIVITY

II. STEPS

2e) Write up the report in detail showing map of stream, its location on the larger map and all calculations and measurements used to determine the gradient. Remember, it will be reviewed by a road engineer.